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INCREASE-SEED GROWING OF CERTIFIED PERENNIAL RYE-GRASS.

MOTHER SEED AND ITS PROGENY COMPARED.

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IT has now been amply demonstrated throughout this country, and there is also accumulating evidence from Australia and elsewhere, that New Zealand certified perennial rye-grass is an excellent type, ideally suited for permanent pasture wherever the soil and climatic conditions make such pasture at all possible. Reports from Great Britain, conservative in the extreme, go to show that the New Zealand certified seed is better than the British commercial. Our trials in the Dominion, also compared over a period of four years, now definitely go to show that the New Zealand certified perennial rye-grass as a type is superior to any type yet tested from any country in the world, including the British indigenous rye-grass harvested and selected from the old pastures of Kent.

Strain and pedigree is rapidly becoming a feature of the herbage-seed trade of the world. One has only to glance through the catalogues of the leading overseas seed firms to realize that the trade is already catering for a growing demand from overseas farmers for authentic strains of pasture plants. The hallmark put upon the New Zealand seeds by the application of certification enables seed houses the world over to handle the New Zealand material with confidence; and we predict from such firms an early demand for New Zealand certified seed. Within New Zealand itself the demand for certified perennial rye-grass is rapidly increasing, and the ready disposal of last season's harvest of 80,000 bushels of machine-dressed certified seed at a high price per bushel, and in a slump period, indicates that farmers require and are prepared to pay for the guarantee of type that certification affords.

The New Zealand output of so-called perennial rye-grass for the last four years is approximately 500,000 bushels per year, or roughly six times the amount of certified true perennial rye-grass produced last year. We are of the opinion that it is only a matter of time for the superiority of the certified seed to become more widely known,

and for the price to fall to nearer the normal price of perennial rye-grass seed, when the output of certified seed must approach the half-million bushel mark in order to meet the internal demand alone.

In view, therefore, of the large internal demand and the overseas demand that is already arising, it becomes imperative to increase greatly the area sown in New Zealand for seed-production purposes. Hawke's Bay and Poverty Bay themselves can increase considerably the area shut up for seed, but these districts will never be in a position to supply sufficient seed to cater for the growing demand. Last season approximately 58,000 bushels of machine-dressed certified seed were produced in these two districts, and this represents considerably more than their total annual production for the last few years. The question of producing certified perennial rye-grass in good seed-growing districts outside Hawke's Bay and Poverty Bay thus demands attention, and the experience of the last two years has definitely shown that the Hawke's Bay and Poverty Bay type can be successfully increase grown in any district in New Zealand where the climate is suitable for true perennial rye-grass seed production.

Hawke's Bay and Poverty Bay in this scheme for increase-seed growing under certification can be regarded as the mother-seed producing areas, and when this project is viewed nationally there is everything to commend such procedure. Those old permanent pastures of Hawke's Bay and Poverty Bay should be viewed as a national heritage; there should be no idea of parochial jealousy, because nature has decreed that the one district is more favourably suited for a specific purpose than another, and no human opinion can alter this fact. There is no question that the South Island is naturally more adapted for annual and short-rotation farming than the North Island; the more rigorous winters alone make supplementary cropping an essential feature. The demand for early spring feed, and for crops that will rapidly fatten lambs in weather not propitious for high grassland production later in the season makes it imperative that special crops be grown, and this means that a good deal of the farm is annually under the plough. Those drier areas of the South Island, such as the Canterbury Plains, North Otago, Central Otago, and Marlborough, particularly, have ideal seed-production climates provided there is sufficient moisture to grow the crops to maturity. Ploughing and cultivation prior to sowing gives depth and activates the soil; it allows easy penetration of what rains fall, and conserves this water-supply so that the sown crop on cultivated land in nine years out of ten gets ideal conditions to grow and mature a good seed crop. In the second, third, and subsequent years short-rotation lands are not usually capable of producing good crops; the ground has hardened, water penetration is more difficult, cracking of the ground in dry weather, &c., all militate against high-production crops from old grassland. Hence it will be only in the more favoured areas of the South Island that old pasture seed-production can compete with old pasture seed-production in the North Island under its more plentiful rainfall and milder climate.

For these reasons we feel that the national seed-growing campaign that should be launched is for growers in the South Island to trade freely with the North Island in matters of old pasture mother seed, and for the South Island to once-grow this on its short-rotation country to supply the bulk of seed for export and for the permanent grazing

pastures of the Dominion as a whole. In this once-growing project the greatest crop will be secured from the first harvest, and crops between 30 to 50 bushels of machine-dressed seed per acre may in normal years be expected. The question that at once comes to the mind of the farmer and seed-merchant is whether this maiden or first-harvest crop is as good as that from later crops, and whether it is a sound agronomic practice from a pasture-formation point of view to harvest seed from a one-year-old pasture.

The question of seed-growing as a business must to some extent be dissociated from the making of the ideal pasture sward. True perennial rye-grass really is more ideally constituted a grazing plant rather than a seed-producing plant, and it will not stand cutting for seed year after year. The best farmers in Hawke's Bay, for example, will not cut the same paddock two years in succession for seed, and where possible three to four, and even five, years elapse before a seeded paddock is again shut up for seed. Where seed production is practised from the same area year after year vegetative tiller shoots become fewer and fewer, the plants weaken, and the sward opens up. This opening-up of the sward, due to the reduction in number of tillers and vigour of these, affords opportunity for annual grasses and clovers to establish.* In Hawke's Bay paddocks that were once good rye-grass pastures may run to a crop dominantly goose-grass or burr clover after the third successive seed crop has been taken from any one area. Cutting a seed crop of rye-grass, therefore, at one year old undoubtedly weakens the sward, as does also a crop of seed at any stage in the life of the pasture. In a seed-growing business, however, this is inevitable, and the grower has to be prepared to sacrifice a certain amount as far as the pasture is concerned in the pursuance of his business.

The bulk seed-grower, provided always there is a source of mother-seed supply available, need not concern himself so much with the production of an ideal sward, and even though the pasture may give out after three years it is better in our opinion to make sure of payable seed crops early in the pasture development, rather than wait until the pasture ages, because of any idea farmers may have that the later crops will be of a better type than the earlier ones. Provided the mother seed is of a good type and up to the standard of the Department's certified mother seed, then there can be little if any fear that the early crops will be different from the later crops. As a matter of fact, given good growth and harvest conditions, from our studies to date the chances are that the first crop produced in the South Island or elsewhere will more closely resemble the parent than subsequent crops from that same area.

There is, however, one big danger in maiden-seed production; and this lies in harvesting a seed crop from that area within six months of sowing down. Thus a crop sown in the spring should not be cut for seed in the following autumn. This in the South Island is scarcely practicable, but in the North Island it is possible to spring-sow and cut a small seed-crop in the following January or February. Our experience at Palmerston North goes to show that of a crop sown out

* We are definitely of opinion, however, that the possibilities of manurial top-dressing to promote good vigorous aftermath growth have not been fully exploited in New Zealand in connection with seed production from the same area for two or more consecutive seasons.

FIG. 1. GENERAL VIEW OF SINGLE-PLANT AREA AT PLANT RESEARCH STATION WHERE A COMPARATIVE STUDY OF CERTIFIED PERENNIAL RYE-GRASS MOTHER SEED AND ITS FIRST-HARVEST PROGENY HAS BEEN MADE.

In these experiments blocks of 100 mother-seed plants alternate with blocks of 100 first-harvest progeny, and in a general glance over the area no perceptible difference between the two lots could be observed. Some broadcast trials are seen on the extreme left.

[*Photo by E. Bruce Levy.*

in the spring only a proportion of plants will produce a seed crop by the following February, six months after. Those plants that produce a full crop of seed-heads within six months of sowing down are of a poor type, and if such a crop were harvested for seed the whole of the product would tend to be of an undesirable type. Given ten months or a full year growing period, however, then all plants in the sowing will flower and seed, and according to the type of the mother seed sown so will be the type of the offspring. Figs. 6 and 8 show clearly these two types of plants, and it will be obvious that were a seed crop produced in six months from sowing down and that resultant crop sown down and again cut for seed, and this repeated two or three times, the original type would very largely be lost, the line coming to consist entirely of free-flowering, early-maturing annual types of plants. Certified first-harvest seed is produced from crops sown out either in the previous autumn or after fourteen to fifteen months have elapsed from the spring sowing. This is a point growers of seed for certification should keep clearly in mind.

Evidence of Single-plant Trials.

The single-plant analysis is the best means of making a critical examination of a line from the point of view of type variation, either between lots of varying origin or lots of the same origin. In order to study the effect of once-growing the Hawke's Bay and Poverty Bay type of perennial rye-grass outside these districts, four thousand single plants were put out at the Plant Research Station. These plants were representative of eighteen mother-seed lines and their first-harvest progeny grown in twenty-two different areas—three in Hawke's Bay itself, two in the Sandon district, two in Marlborough, four in North Canterbury, three in South Canterbury, and eight in Otago and Southland.

Comparison of mother-seed and first-harvest seed lines with regard to Italian rye-grass and slightly awned types of plant present.—In all the mother-seed lines tested—1,800 single plants—not one plant of Italian rye-grass or slightly awned type of plant was noted. In the total of 2,200 first-harvest plants eight strongly or slightly awned plants were found. These were contained in two lines from Marlborough, three from Otago, and one from North Canterbury. This would indicate that there is a slight deterioration due to contamination with Italian and the false perennial rye-grass type as a result of growing the mother seed on land that originally produced a crop of Italian or false perennial. The proportion of these, however, is extremely small, being approximately one-third of 1 per cent., or roundly three plants per thousand. Careful selection and preparation of the ground and subsequent field inspection at harvest time afford a sufficient guarantee that field contamination with Italian and false perennial types is for all practical purposes negligible in once-growing mother seed outside its district of origin, and should cause no concern whatsoever to the farmer laying down permanent pasture.

Comparison of mother-seed and first-harvest seed lines with regard to proportion of undesirable, open-crowned, and early-maturing types.—From single-plant analyses made of some hundreds of mother-seed lines from Hawke's Bay and Poverty Bay it has been shown that no

line is of a uniform type. Erect or semi-erect, dense, tussocky types of plants predominate, and it would appear that the superiority of the New Zealand certified strain is due to this erect and semi-erect, dense, tussocky type. In all lines, however, there is a varying percentage of early-maturing, squat, flat, open-crowned types, which must be regarded as inferior types of plants for the purpose of high-production permanent pasture at least, bearing in mind that the predominating plants in the good false perennial lots and in low-production true perennial lots are essentially of this type.

These types are depicted fairly satisfactorily in Figs. 2 to 5. Table 1 serves to show the number of these poorer types of plants occurring in the mother-seed lines from Hawke's Bay and in their first-harvest progeny. The figures serve to indicate that from a type point of view—regarding the erect, dense, slow-maturing type as the more desirable—there is an approximate 2 per cent. deterioration in once-growing the original mother seed and in harvesting that crop the first year down. Here again, from the point of view of the permanent pasture, the farmer can with perfect safety place full reliance on the first harvest certified permanent pasture seed as representing a high-grade article for the sowing-down of his permanent grassland.

Table 1.—Relative Numbers of Undesirable, Squat, Open-crowned, Early-maturing Types in Original Mother-seed Lines and First-harvest Progeny from those Lines.

In Mother Seed.	In First-harvest Progeny.	District where grown.
Per Cent.	Per Cent.	
16	20	Hawke's Bay.
14	15	Sandon.
12	16	Marlborough.
12	14	North Canterbury.
12	16	South Canterbury.
16	16	Otago and Southland.
13·6	16·1	(Average).

Comparison of mother-seed and first-harvest seed lines with regard to rapidity and extent of flowering, five and six months approximately after sowing down.—As before indicated, rate and extent of flowering is a vital point to be considered in first-harvest seed production. There is no doubt that the poorer types mature earlier than the better ones, and actually it would seem sound to gauge type and persistency in relation to speed of maturity. The seeds in the present study were sown in boxes on 30th July, 1931, and were transferred to their present position as spaced plants 2 ft. apart each way on following 21st October. Table 2 shows the relative number of plants tending to run to maturity five to six months after the seed was sown. Mother-seed lines are contrasted with the first-harvest progeny, and again it will be obvious that there is a slightly greater percentage of early-maturing types in the first-harvest lots compared with the original mother seed, which again serves to emphasize the possibility of rapid deterioration when first-harvest seed is cut and resown year after year. The major lesson here, however, is the fact that no crop of seed should be taken from a spring-sown crop in the autumn following that sowing, for even if the crop is left until late in February it will be noted that 30 to 40 per cent.

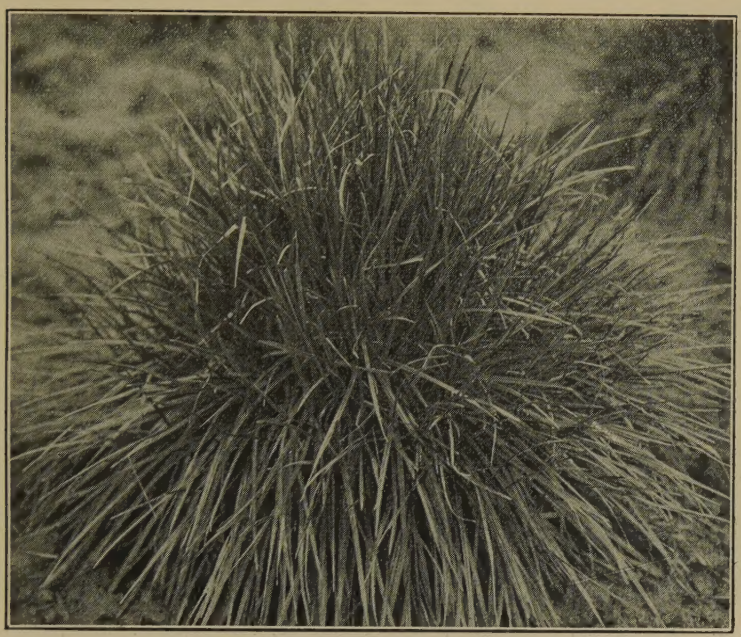

FIG. 2. GROWTH-FORM IN CERTIFIED RYE-GRASS: THE ERECT, DENSE, TUSSOCKY, MATURED PLANT LARGELY RESPONSIBLE FOR THE MARKED SUPERIORITY OF THE NEW ZEALAND CERTIFIED TYPE.

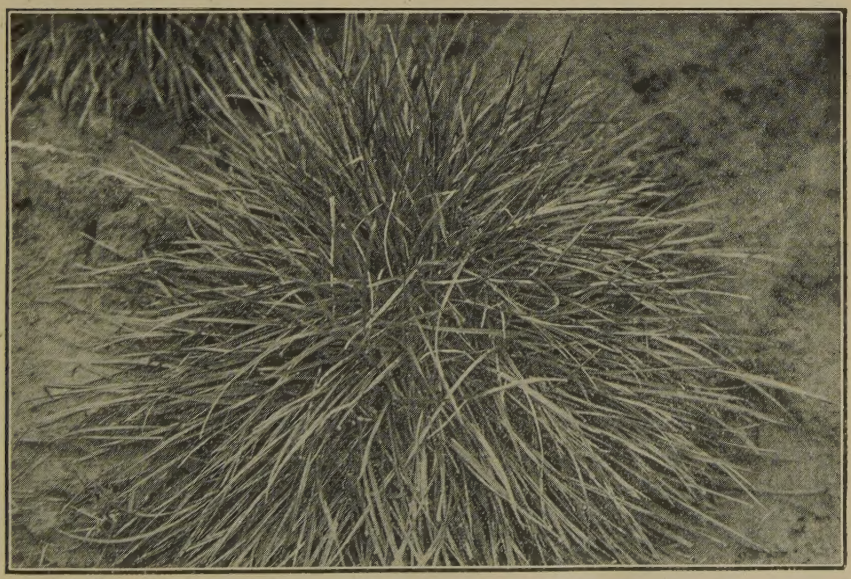

FIG. 3. THE SEMI-ERECT, DENSE, MUCH-TILLERED HIGH-PRODUCING TYPE.

[Photos by E. Bruce Levy.

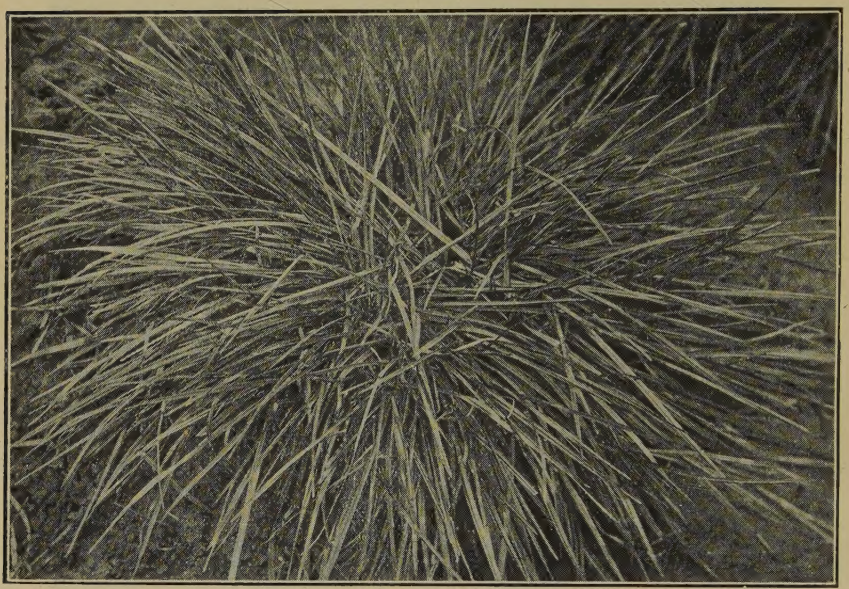

FIG. 4. THE SQUAT, PROSTRATE, OPEN-CROWNED, MODERATELY HIGH-PRODUCING TYPE.

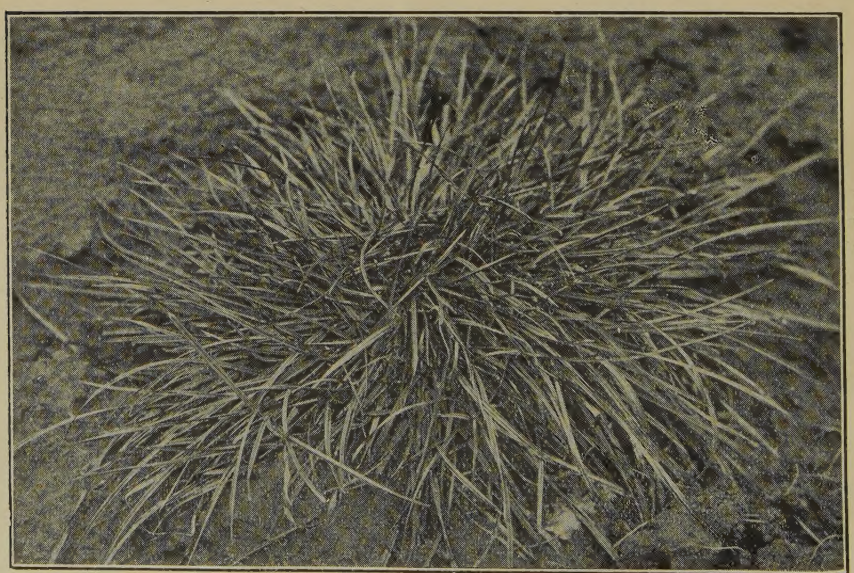

FIG. 5. THE SQUAT, PROSTRATE, FLAT-CROWNED, LOW-PRODUCING, AND SLOW-RECOVERY TYPE.

[*Photos by E. Bruce Levy.*

of the plants have not flowered by this date, and almost invariably such non-flowering types are the most desirable in the line.

In the figures given in the table three heads per plant constitute for record purposes a plant in flower, and the figures as set out are really high as indicating the extent of the flowering that actually occurred. Possibly not more than 20 per cent. of plants produced a full crop of flower heads, and these were essentially all of an undesirable early-maturing short-lived nature.

Table 2.—Relative Speed and Extent of Flowering in Spring-sown Mother-seed Lines and the First-harvest Progeny of those Lines. (Date seed sown, 30/7/31; date planted out, 21/10/31.)

Percentage of Plants flowering 13/1/32.		Percentage of Plants flowering 17/2/32.		District where grown.
In Mother-seed Lines.	In First-harvest Progeny.	In Mother Seed.	In First-harvest Progeny.	
43	46	70	70	Hawke's Bay.
44	55	69	72	Sandon.
31	43	55	68	Marlborough.
51	57	75	75	North Canterbury.
45	48	72	69	South Canterbury.
47	50	70	73	Southland and Otago.
43·5	49·8	68·5	71·1	(Average).

Comparison of mother-seed and first-harvest seed lines with regard to rust susceptibility.—Rust susceptibility in rye-grass may be regarded to some extent as an index of type, the weaker-constitutioned, false perennial types being more susceptible to rust—in the North Island at least—than the vigorous true perennial certified type. An analysis of single plants from the rust susceptibility point of view, therefore, gives a good indication whether there has been any appreciable weakening in the Hawke's Bay type by once-growing the mother seed and in harvesting a first-harvest progeny crop. Table 3 puts the position fairly clearly, and indicates that there has been scarcely any perceptible change in susceptibility by once-growing outside the district of origin.

Table 3.—Relative Rust Susceptibility of Mother-seed Lines compared with the First-harvest Progeny of those Lines.

Mother-seed Lines.	First-harvest Progeny.	District where grown.
Index Figure.	Index Figure.	
100	101	Hawke's Bay.
100	100	Sandon.
100	103	Marlborough.
100	105	North Canterbury.
100	103	South Canterbury.
100	97	Otago and Southland.

Comparison of growth-forms within the mother-seed lines compared with the first-harvest progeny.—There seems to be little doubt that the marked superiority of the Hawke's Bay and Poverty Bay perennial

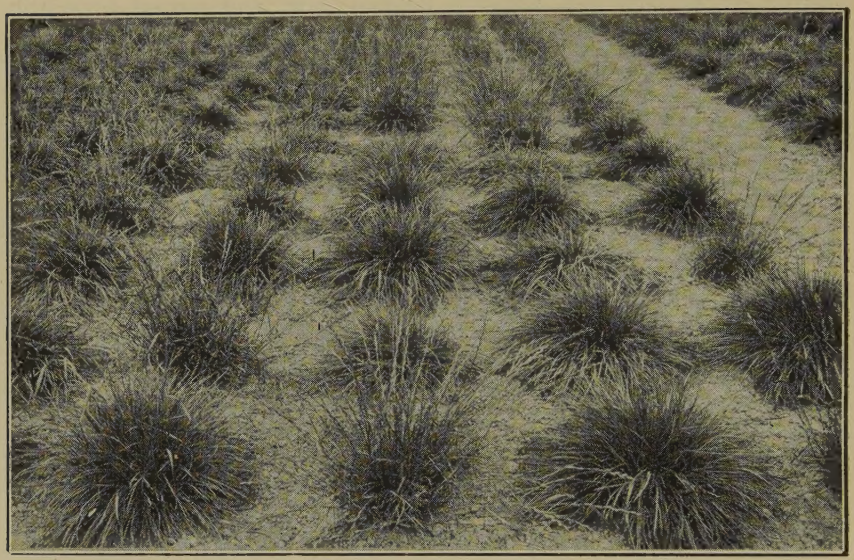

FIG. 6. CERTIFIED RYE-GRASS FIRST-HARVEST PROGENY SINGLE PLANTS FROM LINE GROWN IN SOUTHLAND.

Photo taken on 3/2/32, when plants were six months old. Note, generally, early-maturing type of plants in full flower, while the good leaf-producers are showing an absence of flower-heads. Compare with Fig. 7.

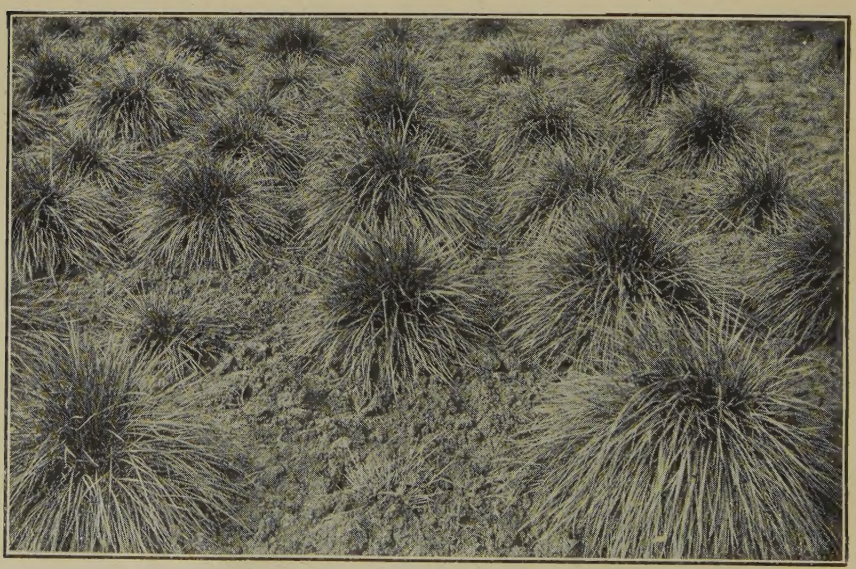

FIG. 7. THE SAME PLOT AS IN FIG. 6, PHOTOGRAPHED ON 25/5/32.

Showing generally the recovery after cutting, and specifically the non-recovery of the early-maturing free-flowering six-months-old plants. Compare front plant of middle row and second plant of row on left with the same plants in Fig. 6.

[Photos by E. Bruce Levy.

rye-grass over all other perennial rye-grass lots yet tested is due to the presence in the Hawke's Bay and Poverty Bay type of an erect, dense, tussocky type of plant (Fig. 2). The prevalence of these erect and semi-erect types of plants may be taken as some index of the quality of the line and whether or not there has been marked deterioration by once-growing. Table 4 shows that in the markedly erect type there has been in the aggregate a falling-away in numbers within the first-harvest lots of the erect and semi-erect type compared with the parent mother-seed lots.

Table 4.—Relative Percentages of the Different Growth-forms within Mother-seed Lots and the First-harvest Progeny.

Class.	Growth-form.				
	Erect.	Semi-erect.	Semi-prostrate.	Prostrate.	Dead.
Mother-seed lines ..	20	28	27	22	3
First-harvest progeny	17	27	27	26	3

Comparison of growth-forms within the various lots of mother-seed and first-harvest lots showing relatively different germinability.—There is every possibility that the various growth-forms in rye-grass are differentially susceptible to injury when a crop is grown under adverse climatic conditions. Certainly the rye-grass crop is sensitive to the weather conditions ruling irrespective of the district where grown. Thus in Hawke's Bay and Sandon, for example, in a relatively wet year the germination of the crop is universally low and in a dry year it is universally high. The question arises whether any one growth-form within those lines is more susceptible to injury than another, or whether all forms suffer alike. Table 5 gives some indication that where a rye-grass crop is adversely affected through bad climatic and bad harvesting conditions, there is a reduction in the erect, dense, tussocky type, and an increase in the squat, open-crowned, prostrate type. If this is so, high germinability is important in a line, as this would indicate preservation of the type more definitely than where a crop had suffered through adverse harvesting conditions.

Table 5.—Relative Percentages of Growth-forms within Lines of High and Low Germinability.

Lines.	Growth-form.				
	Erect.	Semi-erect.	Semi-prostrate.	Prostrate.	Dead.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
High-germinating ..	19	30	28	23	2
Low-germinating ..	16	27	25	30	3

Comparison of persistency within the mother-seed lines compared with their first-harvest progeny and with typical bad false-perennial lots.—High persistency, coupled with high production, is a marked characteristic of New Zealand certified perennial rye-grass, and from the experiments to date, both in the single plant and in broadcast swards, the

FIG. 8. CERTIFIED RYE-GRASS FIRST-HARVEST PROGENY SINGLE PLANTS FROM LINE GROWN IN NORTH CANTERBURY.

Photo taken on 3/2/32, when plants were six months old. Here, as in Fig. 6, differential flowering can be observed.

FIG. 9. THE SAME PLOT AS IN FIG. 8, PHOTOGRAPHED ON 25/5/32.

Showing generally the recovery after cutting, and here again the early flowering type (compare front plants middle row in this and Fig. 8) has made relatively poorer recovery than the non-early-flowering types on either side.

[*Photos by E. Bruce Levy.*

first-harvest progeny is equal in persistency to the mother seed itself. In Tables 4 and 5 it will be noted that the death-rate after twelve months is extremely low and virtually equal within the two lots. This is in marked contrast to typical false perennial lots, where the death-rate after twelve months may be extremely high. This is clearly exemplified in Table 6.

Table 6.—Showing relative Persistency of Mother-seed Lots and their Progeny compared with False Perennial Lots of Rye-grass. (All plots twelve months old.)

Mother Seed, Type 1.	First-harvest Progeny, Type 1.	Good False, Type 3.	Average False, Type 4.	Bad False, Type 5
3 per cent. dead	3 per cent. dead	5 per cent. dead	24 per cent. dead	58 per cent. dead.

Evidence of Broadcast Trials.

The evidence of single plants would indicate that the first-harvest progeny of certified mother seed was approximately 2 per cent. poorer than the parent seed. As one would surmise, this small difference is quite indiscernible when the lots are sown side by side in broadcast trials. In this study to date a total of 171 lots of first-harvest progeny from Hawke's Bay, Poverty Bay, Sandon, Marlborough, Canterbury, Southland, and Otago have been broadcast sown alongside mother-seed lots, and after eighteen months' trial it can definitely be asserted that there is no discernible difference between the mother-seed lots and the first-harvest progeny.

For the sowing-down of permanent pasture, therefore, apart altogether from seed production, the deciding factor in buying certified rye-grass seed is largely a matter of price. One knows, of course, that the farmer who has bought old-pasture seed in the past will probably continue to buy old-pasture seed irrespective of price. The evidence put forward here is simply a statement of the facts as we see it after very comprehensive trials.

The seed-grower, if he is to take full advantage of the benefits of certification, must sow down certified mother seed, and the work of the last twelve months has fully shown the wisdom of this. A 2 per cent. deterioration in the once-growing is negligible, but if that first-harvest seed is grown again for seed the deterioration, at a conservative estimate, would double itself and in all probability keep on doubling itself, until finally one had a false perennial type typical of the average commercial rye-grass on the market to-day. This all serves to emphasize the value to New Zealand of our present mother-seed areas, and indicates definitely that if the type is to be maintained seed-growers should make frequent and regular renewals of mother-seed stocks, preferably, one would say at the moment, from Hawke's Bay and Poverty Bay areas where the certified type has been evolved, and where one has the greater guarantee that the type will remain constant. There is no guarantee at the moment that certified mother seed from Hawke's Bay or Poverty Bay sown out, say, in the South Island or in Australia will have retained all the desirable characteristics of the

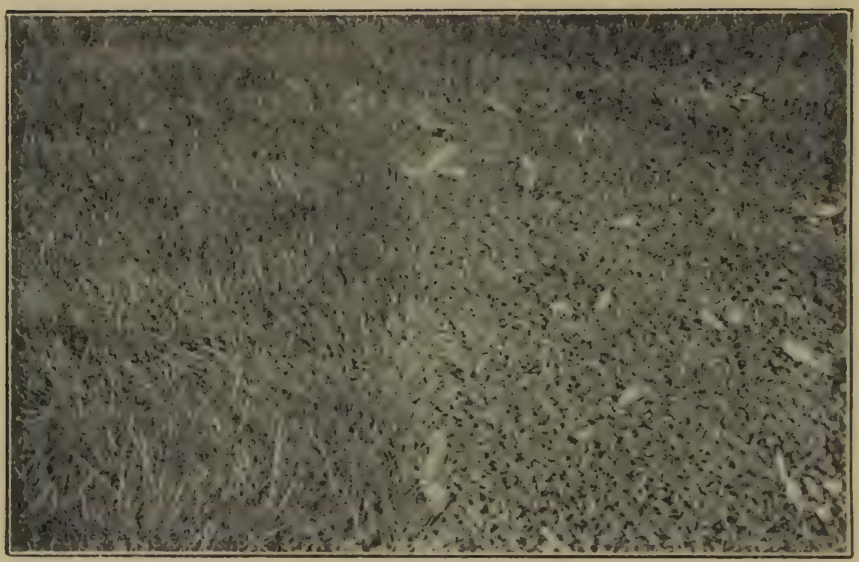

FIG. 10. FIRST-HARVEST PROGENY OF CERTIFIED PERENNIAL RYE-GRASS (ON LEFT) AND NON-CERTIFIED FALSE PERENNIAL FROM SOUTH CANTERBURY (ON RIGHT).

Plots sown 16/10/31 and photographed 25/5/32, following a dry spring and summer. The false perennial rye-grass is largely replaced by volunteer white clover.

FIG. 11. FIRST-HARVEST PROGENY OF CERTIFIED RYE-GRASS (ON LEFT) AND A FALSE PERENNIAL RYE-GRASS FROM SOUTHLAND (ON RIGHT).

Plots sown 16/4/31 and photographed 20/5/32, thirteen months old. It is obvious from this and Fig. 10 that type of rye-grass is more important than age of stand from which the crop has been produced.

[*Photos by E. Bruce Levy.*

certified rye-grass in, say, ten years' time. Environment will probably play its moulding influence with the years.

We particularly wish to stress the following points :—

(1) There is a slight deterioration in the first-harvest progeny.

(2) New Zealand seed-growers, if the type is to be maintained, should regard certified-seed production as a national undertaking, and should be prepared to buy freely from those districts where the certified type has been evolved, for the purpose of renewals of reliable mother-seed stocks. This also applies to overseas growers who may wish to once-grow the New Zealand certified perennial rye-grass type.

(3) No first-harvest seed-crop should be taken from an area until it has gone through the full growing year—that is, spring-sown crops should not be harvested for seed in the following January or February, but should run until the next harvest season. Autumn-sown crops, however, may be harvested the following summer.

DAIRY-HERD TESTING IN NEW ZEALAND.

REVIEW OF THE 1931–32 SEASON.

W. M. SINGLETON, Director of Dairy Division, Wellington.

IN reviewing the past season's herd-testing work it must be kept in mind that 1931–32 was one of the most difficult periods the dairy industry of this country has yet experienced, a period of extremely low prices accompanied by climatic conditions which, on account of the abnormal dryness in many dairying districts, retarded production. A decrease in both average production and number of cows tested was anticipated, although the falling-off in membership was probably less than was generally expected. There were roughly eighty thousand more cows milked in the Dominion in 1931–32 than in 1930–31, an increase of about 5·3 per cent., while the total butterfat-production over the same period increased approximately 5 per cent. The average production of tested cows decreased by 4.18 lb. of butterfat, being 241·05 lb. for 1930–31 and 236·87 lb. for the season under review.

To briefly sum up the position relating to average production of tested cows, it would appear that four principal factors have operated against an increase. These are (1) an adverse season climatically, (2) a decreased use of fertilizers during the preceding season, (3) an increase in first calvers as the result of more cows having been brought into milk, and (4) non-culling or less culling, because of the attempt to obtain a maximum total production.

Some 259,857 cows were systematically tested last season, a falling-off of 11,547 from the preceding season. The tested cows represented approximately 16·4 per cent. of the total cows in milk. The Group test has now risen to such prominence as to account for over 90 per cent. of last season's tested cows ; cows tested under the Association own-sample system numbered 25,111 ; and 219 cows were tested by dairy companies on behalf of their suppliers. Although, therefore, there is no marked falling-off in number of tested cows, the cows in milk are increasing so rapidly as to make the relationship between total

Table 1.—Numbers of Cows tested Twice or more, and Percentages of Total Cows in Milk, classified according to Land Districts.

Land District.	1927–28.		1928–29.		1929–30.		1930–31.		1931–32.	
	Cows Tested.	Percentage of total Cows in Milk.	Cows Tested.	Percentage of total Cows in Milk.	Cows Tested.	Percentage of total Cows in Milk.	Cows Tested.	Percentage of total Cows in Milk.	Cows Tested.	Percentage of total Cows in Milk.
North Auckland ..	41,067	20·2	48,713	23·3	58,113	24·5	55,283	20·9	56,091	19·6
Auckland	101,796	29·0	106,823	28·2	109,811	26·8	102,534	22·6	99,806	20·6
Gisborne	5,756	19·2	9,579	29·0	12,329	33·4	10,418	25·0	9,145	20·4
Hawke's Bay ..	4,638	10·1	8,243	17·5	8,505	17·0	8,742	16·7	4,933	9·2
Taranaki	23,581	11·9	30,298	15·1	31,693	15·1	32,519	14·7	31,179	13·8
Wellington ..	32,267	17·9	36,547	19·6	42,224	21·1	35,875	16·7	30,569	13·6
North Island ..	209,105	20·7	240,203	22·8	262,675	23·0	245,371	19·7	231,723	17·6
Nelson	656	2·5	1,241	4·8	2,128	8·0	5,732	20·9	6,637	23·7
Marlborough ..	434	3·0	2,176	14·7	3,628	23·7	3,064	19·2	2,647	16·2
Westland	..	..	..	..	..	..	2,380	18·8	5,030	39·6
Canterbury ..	3,280	4·6	3,524	4·9	2,816	3·8	3,244	4·3	2,344	3·0
Otago	769	1·5	581	1·1	2,975	5·7	3,775	7·0	4,480	7·9
Southland ..	9,886	14·7	11,869	17·4	9,509	13·7	7,838	10·9	6,996	9·4
South Island ..	15,025	6·3	19,391	8·0	21,056	8·5	26,033	10·2	28,134	10·6
Dominion ..	224,150	18·0	259,594	20·1	283,731	20·4	271,404	18·0	259,857	16·4

NOTES.—"Total Cows in Milk" is at 31st January in each year. The 1931–32 percentages are calculated on interim figures.

cows and tested cows less favourable than could be desired. The peak year was reached in 1929–30, when 20·4 per cent. of the country's cows were under test, but, as will be seen, there has since been a drop of 4 per cent. in two seasons.

Despite the general financial stringency there were some eleven new groups operating last season, and obviously these helped to make the position appear more favourable, there having been a fairly substantial falling-off in some of the older established districts. The South Island again showed an increase, and it is pleasing to find the herd-testing movement so firmly established in Westland, which last year tested some 39·6 per cent. of its total cows in milk—easily the highest percentage for the Dominion. The establishment of new groups is no doubt due in no small measure to the financial assistance rendered by the Government subsidy to herd-testing. The terms relating to the distribution of the subsidy have been such that newly formed groups have received a grant up to £50 to cover the cost of outfit, and in the majority of cases this sum meets the full expenditure.

Table 1 provides a classification of tested cows according to land districts, and includes a column for percentage of cows tested. The figures relating to the 1931–32 season are based on interim returns only, but are not likely to be materially altered. Any irregularities will be corrected in next year's summary. This table affords clear evidence of the fact that, taken as a whole, herd-testing has lost ground fairly heavily.

Table 2 provides a general survey of the number and size of the various organizations. As explained in previous reviews, the term "organization" denotes any herd-testing body, whether Group, Association, or Dairy Company. Moreover, the term applies to each individual unit; for example, an organization operating ten groups is included as ten, not one. By an "effective" summary is meant that the table is compiled from individual summaries which appear sufficiently complete and reliable to justify inclusion. Notable features of this table are that, while the number of organizations has increased, there has been a marked falling-off in the number of cows per organization; in other words, the groups have been smaller.

Table 2.—Number of Cows, Herds, and Organizations represented in Effective Seasons' Summaries received. (Basis: All Cows in Milk 100 Days or over.)*

	1929-30.	1930–31.	1931–32.
Number of organizations	282	270	278
Number of herds	7,107	6,347	5,985
Number of cows	272,554	260,469	251,441
Average number of herds per organization	25	23	22
Average number of cows per herd ..	38	41	42
Average number of cows per organization ..	967	964	904

* Including both Group and Association systems, and on basis of sections or units.

Table 3 indicates the position from the point of view of the average number of cows and herds per organization. As will be seen, the number of cows per group continues to decrease. As pointed out last year, this is an undesirable trend, having an unfavourable influence on cost of operation.

Table 3.—Average Size of Associations and Groups for which Effective Seasons' Summaries on the Basis of all Cows in Milk 100 Days or over were received.

System.	Season.	Average Number of Herds per Association or Group.	Average Number of Cows per Association or Group.	Average Number of Cows per Herd.
Group ..	1927–28	28	1,250	45
	1928–29	29	1,304	44
	1929–30	28	1,288	46
	1930–31	25	1,216	47
	1931–32	24	1,166	48
Association ..	1927–28	21	414	20
	1928–29	20	401	19
	1929–30	20	363	19
	1930–31	18	333	18
	1931–32	15	270	18

Table 4 is a very comprehensive production summary, and enables a useful survey of the general position to be made. The remarkable extremes in the highest and lowest yields for herds and individuals are noteworthy. One of the good features is the pronounced increase in the average days in milk for all cows. The figures in this table are based on 5,985 herds, of which 4,772 were tested under the Group system and the remainder of 1,213 under Association own-sample test, as compared with a total of 6,347 herds (4,983 Group and 1,364 Association) for 1930–31.

Table 4.—Grand Summary of all Effective Herd-testing Results on the Basis of all Cows in Milk 100 Days or over received for the Last Two Seasons.

—	1930–31.			1931–32.		
	Number of Cows.	Days in Milk.	Butterfat-production.	Number of Cows.	Days in Milk.	Butterfat-production.
			lb.			lb.
Average for all cows	260,469	247	241·05	251,441	253	236·87
Average for all Group cows ..	234,799	250	241·50	229,606	256	238·11
Average for all Association cows	25,670	225	236·90	21,835	229	223·79
Highest Group average ..	812	277	302·73	437	265	294·27
Lowest Group average ..	326	211	152·76	539	243	185·52
Highest Association average ..	4	275	405·00	10	268	397·00
Lowest Association average ..	54	187	139·62	83	173	143·57
Highest Group herd	12	286	430·25	7	276	458·29
Lowest Group herd	26	132	77·19	39	131	56·54
Highest Association herd ..	4	258	434·06	5	329	478·99
Lowest Association herd ..	2	107	67·91	5	122	68·24
Highest Group cow	..	324	724·00	..	337	909·00
Lowest Group cow	..	100	12·00	..	130	11·00
Highest Association cow ..	..	306	714·31	..	332	598·36
Lowest Association cow ..	..	100	27·00	..	107	28·20
Average daily production of butterfat for all Group cows	..	..	0·96	..	..	0·93
Average daily production of butterfat for all Association cows	..	..	1·05	..	..	0·98

Table 5.—Average Production, according to Land Districts, of all Cows under Herd-test for which Effective Seasons' Summaries were obtained. (Basis: 100 Days or over.)

Land District.	1928–29.			1929–30.			1930–31.			1931–32.		
	Cows in Summary.	Average Days in Milk.	Average Butterfat.	Cows in Summary.	Average Days in Milk.	Average Butterfat.	Cows in Summary.	Average Days in Milk.	Average Butterfat.	Cows in Summary.	Average Days in Milk.	Average Butterfat.
			lb.			lb.			lb.			lb.
North Auckland	45,735	234	222·87	55,458	245	241·15	53,158	243	218·16	54,101	253	229·56
Auckland	102,239	247	238·27	106,549	256	260·27	99,042	253	243·95	97,218	260	233·61
Gisborne	9,045	233	230·45	11,606	236	234·62	9,899	235	225·13	8,853	250	242·29
Hawke's Bay	7,705	243	249·61	8,281	221	258·06	8,324	227	219·28	4,808	253	246·71
Taranaki	28,515	249	259·76	30,366	254	271·59	31,633	259	268·40	29,960	257	256·41
Wellington	34,524	243	257·93	40,343	242	246·80	34,152	248	252·29	29,215	244	226·03
North Island ..	227,763	243	240·92	252,603	249	254·03	236,208	249	240·97	224,155	256	235·32
Nelson	936	203	237·00	1,976	225	255·15	5,464	229	244·36	6,447	236	250·16
Marlborough	1,956	217	244·84	3,417	224	250·76	2,913	237	247·20	2,567	239	247·67
Westland	..	..	..	..	..	..	2,321	229	234·54	4,902	232	241·59
Canterbury	3,081	218	237·67	2,506	206	237·65	2,627	212	220·57	2,155	219	226·67
Otago	552	219	253·99	2,790	227	244·41	3,535	228	237·94	4,319	236	252·03
Southland	11,523	225	231·89	9,262	227	249·92	7,401	231	249·47	6,896	237	261·26
South Island ..	18,048	222	235·22	19,951	224	248·27	24,261	229	241·81	27,286	234	249·63
Dominion	245,811	242	240·50	272,554	247	253·61	260,469	247	241·05	251,441	253	236·87

In Table 5 the butterfat-production of tested cows is classified according to land districts. All districts in the South Island showed an increase, while average production for the South Island as a whole rose by 7·82 lb. of butterfat. The position was doubtless assisted by the fact that Otago and Southland, and in a lesser degree Westland, experienced a more normal season climatically.

Subsidies and General.

Herd-testing received considerable assistance for the past season by way of subsidies. The New Zealand Dairy Produce Board's grant of £6,000 has already been distributed, and it is expected that the Government subsidy of approximately £7,700 will be allocated at an early date. The final result will be that newly-formed groups will in most cases have been fully reimbursed for expenditure on purchase of plant, and that herd-owners will have received a total of around 11d. per cow if testing under the Group system or half that sum if testing under the Association own-sample test. In addition, many of the larger organizations made substantial reductions in fees last year, and have probably reached the minimum commensurate with effective operation.

The sub-committee of the New Zealand Herd-testing Central Executive met on some half-dozen occasions during the season, and has done valuable work in the direction of assisting to place the movement on a sounder and more uniform footing. The Federation Supervisor of Herd-testing, Mr. C. M. Hume, has had a busy year, having paid personal visits to practically every organization in the Dominion.

Thanks are again due to officers in charge of herd-testing organizations for supply of the data necessary for compilation of the foregoing summary. Returns for nearly 97 per cent. of the cows tested twice or more were received in sufficiently complete and reliable form for inclusion, and in the great majority of cases summaries were submitted promptly.

Co-operation by the Wheat Research Institute.—The second annual report of the Wheat Research Institute refers to this aspect of the work as follows: "Co-operation with the Department of Agriculture has been maintained and extended in various directions, and the Institute acknowledges the great assistance it has received from the Director-General and staff of that Department. An important step forward was made when the Department moved its seed-growing station to fields belonging to Lincoln College and immediately contiguous to that occupied by the Institute. All the stages of seed-wheat production are now carried out on one farm, although by three institutions. This Institute imports or produces new varieties and tests their suitability for commercial utilization When they are proved useful they are handed over to the Department of Agriculture, which raises of each a stock of pure seed sufficient to sow a field—and maintains this supply. This pure seed is then handed on to Lincoln College, which grows it on a commercial scale, threshes and dresses it on its own machines, and subsequently arranges for its distribution in a pure state to the farmers of the country. Besides this the Department of Agriculture has in consultation with the Institute conducted wheat-variety trials in all parts of the wheat-growing area, and the Institute has investigated the plant response to manures for the Department and seed-sowing methods for the College. The College has, in its turn, given every facility for our work in accommodation, equipment, and labour.

POTATO VARIETY TRIALS CONDUCTED BY THE FIELDS DIVISION.

SEASONS 1930–31 AND 1931–32.

THIS series of potato variety trials was commenced by the Fields Division in the season 1930–31, when thirty varieties were under trial at sixteen different centres. The results were published in the *Journal* for September, 1931.

During the 1931–32 season thirteen trials were again conducted on the following farms: Ruakura Farm of Instruction, Hamilton; N. Hughes, Maxwell, Wanganui; M. Voss, Karere, Manawatu; High School, Rangiora, Canterbury; St. Andrew's College, Papanui, Canterbury; L. T. Wright, Annat, Canterbury; Boys' High School, Timaru; W. T. Sings, Awamoa, North Otago; G. H. Craig, Mosgiel, Otago; J. F. Bell, Stirling, Otago; Gore Experimental Area, Southland; C. H. Wilson, Lorneville, Southland; C. E. Knowler, Tuatapere, Southland.

Of the varieties under trial in the previous season six were discarded, while seven additional varieties were included. In the case of those varieties under trial for a second season forty sets were reserved from the previous crop and replanted, while of the new varieties ten tubers from the Government Pure Seed Station, Lincoln, were included at each centre.

In order to avoid as far as possible the effect of varying degrees of virus infection in the different varieties, the original material sent out for the first season's trial was selected from lines showing the least percentage of virus. Unfortunately, however, the percentage of virus was even then relatively high in a few varieties, and in the second season considerable infection showed due to the spread of disease during the first season. This was particularly so in the case of the varieties Arran Chief, Iron Duke, and Bresee's Prolific, while Early Regent bolter also showed a fair amount of virus in the second season's trials. Too much reliance therefore should not be placed on the unfavourable report on these. A fresh supply of healthy seed will be required if these trials are to be continued.

There has been close agreement between the results obtained for the two seasons, and the present report is in the nature of a summary of both.

JUDGING FACTORS EXPLAINED.

Varieties have been judged on the following points, and the marks given are the average of the two season's results:—

(1) Cropping power: This is an estimate of the yield computed by adding to the yield of table-size tubers half that of seed-size tubers. The figure given is in tons per acre, and is the average over the whole of the trials.

(2) Range of adaptability: In this column an attempt has been made to convey some idea of the general performance of each variety in the districts concerned. It will be noted that in general the figure conforms to the cropping power.

(3) Commercial possibilities: This figure is the average of marks allotted in the trials for the relative value of each variety from a commercial viewpoint.

(4) Maturity: While the period from planting to ripening has not been recorded with any great accuracy, it is interesting to note that the relative order of maturity shows no great variation in the two seasons' results. One point, however, stands out. Whereas the average time to reach maturity for first earlies in 1930–31 was 112 days, in 1931–32 it was 139 days. There is the same variation, though less marked, in the later-maturing varieties. As a result the varieties included in the trial for the first time this season appear to be wrongly grouped in the tables. They have been so placed, however, following comparisons with the figures for other varieties in the 1931–32 season.

(5) Blight resistance: Except in two instances, the figures for blight resistance agree very closely in the two seasons. It appears therefore as though more reliance can be placed on these figures than was originally thought. Seasonal conditions have such an effect, however, that comparisons can be made only between those varieties maturing at about the same stage.

No attempt has been made to record cooking qualities in the second season, but some notes are given on the cooking qualities of the new varieties. Those of the other varieties may be found in the records of the first season's trials.

Grouping of Varieties.

Varieties are grouped into four classes, and it is interesting to record that in no case has it been found necessary to change the grouping which was made on the 1930–31 results. It should be remembered that while comparisons in cropping power and maturity may be made between varieties of one class and those of another, factors such as range of adaptability, commercial possibilities, and blight resistance are so influenced by date of maturity as to limit comparisons to those varieties in one class only. Results are presented in Tables 1 to 4.

Table 1.—Main-crop Varieties (Average of Two Seasons, 1930–31 and 1931–32).

Variety.	Cropping Power per Acre.	Range of Adaptability —0–10.	Commercial Possibilities— 0–10.	Maturity.	Blight Resistance— 0–10.
	Tons.			Days.	
Kerr's Pink	9·7	9	6½	170	8
Dakota	9·2	8½	7½	174	4½
Up-to-Date	9·2	8	9	167	3½
Aucklander Tall-top ..	8·9	8	8	172	9
Field Marshal ..	8·9	7½	9	164	7
Endurance	7·8	5½	6	164	3½
Northern Star ..	7·5	5	5½	170	7½
Arran Consul ..	7·4	5½	7½	165	8
Iron Duke* ...	7·1	4	7	175	9
Arran Chief* ..	6·2	2	7½	167	5
Average yield ..	8·2	..	..	..	..

* Results misleading on account of virus disease.

Note.—For allocation of points for Range of Adaptability, &c., in this and subsequent tables, see preceding section headed "Judging Factors explained."

Comments on Varieties listed in Table 1.

Kerr's Pink.—This variety has again done very well. The pink colour of the skin has caused marks to be deducted for "commercial possibilities."

Dakota has done well in each season. This is another case in which a variety has lost marks for commercial possibilities on account of its skin colour. It appears to be regaining some of its popularity which had waned over the last few seasons.

Up-to-Date and Field Marshal.—Neither of these varieties has done as well as in the first season—probably due to spread of virus. On the whole, however, they have maintained a good position.

Aucklander Tall-top has headed the yield on this season's results, but its poor performance last year indicated that, as mentioned in the previous report, it is a variety which requires certain conditions to yield heavily. It was placed first in five centres in the second season, but it is still impossible to give a lead as to the limiting factors in connection with this variety.

Endurance.—As a result of the second season's trials, this variety does not seem to warrant recommendation for general use, its commercial possibilities being low, while its blight susceptibility is high.

Northern Star.—Further results confirm the opinion expressed last season, that the sphere of usefulness of this variety is limited to districts where double cropping is practised.

Arran Consul has not improved its position when compared with its performance in the first season.

Iron Duke and Arran Chief have both been adversely affected by the presence of virus diseases, and the trials, so far as these varieties are concerned, have given practically no information.

Table 2.—Early Main-crop Varieties (Average of Two Seasons, 1930–31 and 1931–32).

Variety.	Cropping Power per Acre.	Range of Adaptability—0–10.	Commercial Possibilities—0–10.	Maturity.	Blight Resistance—0–10.
	Tons.			Days.	
Arran Banner ..	9·7	10	9½	156	7
Aucklander Short-top	8·1	7½	9½	157	7
Burbank*	8·0	8	7	161	7
Arran Victory* ..	7·9	7	6	163	9
Abundance	7·8	5½	8	162	3
Great Scot	7·4	5	8½	151	8½
Majestic	7·2	5	7½	152	8
Bresee's Prolific† ..	7·1	4½	6½	157	2½
King Edward ..	5·8	1	8	159	6
Average yield ..	7·6	..	..	..	..

* Results of one year's trials only. † Results misleading on account of virus disease.

Comments on Varieties in Table 2.

Arran Banner.—This variety has fully justified the recommendation made after the first season. It is again the outstanding variety in the trials.

Aucklander Short-top (commonly sold as Sutton's Supreme).—Has maintained a high position throughout the tests.

Burbank.—On the results of one season's trials only this variety has done quite well. Tubers are liable to roughness especially on heavy land. Flesh very pale lemon. Medium flavour.

Arran Victory.—A promising white-fleshed variety. It has lost marks under "Commercial Possibilities" on account of its purple skin. It is an exceptionally floury potato, with a good flavour, but seems liable to develop "brown fleck" under certain conditions.

Abundance.—This variety has not done so well in the second season. It would appear to be almost in the main-crop group, and its susceptibility to blight detracts from its value.

Great Scot.—Another variety which has not done quite so well in 1931–32. It is the earliest variety in the group and as such can be recommended.

Majestic.—Has again not come up to expectations. In certain cases the variety yields well, and under such circumstances is quite worth growing.

Bresee's Prolific.—The results from this variety tend to demonstrate the adverse effects of virus disease in a line.

King Edward.—Is again bottom in its group. This variety can only be recommended for growing in Otago and Southland; elsewhere it is not popular.

Table 3.—Second-early Varieties (Average of Two Seasons, 1930–31 and 1931–32).

Variety.	Cropping Power per Acre.	Range of Adaptability—0–10.	Commercial Possibilities—0–10.	Maturity.	Blight Resistance—0–10.
	Tons.			Days.	
Early Regent bolter* ..	6·2	8	6	147	2
Ally	6·0	9½	8	141	5½
British Queen ..	4·8	6½	6½	146	1
Witchhill	4·2	3	7	134	4
Sharpe's Express ..	4·0	2½	6	135	1½
Average yield ..	5·0	..	..	..	..

* Results of one year's trials only.

Comments on Varieties in Table 3.

Early Regent Bolter.—This bolter selection from Early Regent has done very well in its first season of trial. The flesh is white, firm to floury. The line distributed contained a fair percentage of virus disease, so that with a healthier line an even higher yield may be obtained. Unfortunately, the variety is very susceptible to late blight.

Ally.—This variety has again done well.

British Queen has dropped in yield in the past season, and is definitely of a poorer class than either Alley or the Early Regent bolter.

Sharpe's Express and Witchhill can only be considered of use for early market and garden culture.

Table 4.—First-early Varieties (Average of Two Seasons, 1930–31 and 1931–32).

Variety.	Cropping Power per Acre.	Range of Adaptability—0–10.	Commercial Possibilities—0–10.	Maturity.	Blight Resistance—0–10.
	Tons.			Days.	
Jersey Bennes* ..	5·4	10	8	142	6
Early Regent ..	5·0	8	6½	127	3
Epicure	4·2	6	7	121	2
Early Puritan ..	3·9	5½	7	127	2½
May Queen* ..	3·9	5	5	138	8
Eclipse*	3·4	2	5	141	6
Di Vernon* ..	3·3	2	6	138	8
Average yield ..	4·1	..	..	..	..

* Results of one year's trails only.

Comments on Varieties in Table 4.

Jersey Bennes.—A variety which has done very well in its first season's trials. Should become a popular first early when better known. Flesh slightly lemon. Medium flavour.

Early Regent, Epicure, and Early Puritan.—Have all performed in a similar manner to the 1930–31 season.

May Queen, Eclipse, and Di Vernon.—None of these varieties have yielded sufficiently well for them to be recommended for commercial purposes. The two first have a white flesh and good flavour; Di Vernon is very white-fleshed, floury, with good flavour.

General Remarks.

It is pleasing to note that in both the first-early and second-early groups fresh varieties have been included which are showing considerable promise. In the past the absence of any really first-class early variety has been very noticeable. The present indications are that Jersey Bennes will largely fill the requirements in this direction.

Arran Banner has again done remarkably well, and already there is a big demand for seed of this variety.

The results of the 1931–32 trials have proved of great value in confirming the results obtained in the 1930–31 season. While it is yet impossible to attempt to determine what varieties are most suitable for any particular area, the trials have shown that certain varieties are well ahead of others for general New Zealand conditions.

The field-work in connection with these trials was carried out by field officers under the supervision of the Fields Superintendents at Auckland, Palmerston North, Christchurch, and Dunedin respectively.

The Department acknowledges the co-operation of the growers mentioned earlier in the report in providing facilities for these trials to be undertaken.

—J. W. Woodcock, Assistant Crop Experimentalist, Plant Research Station.

—J. H. Claridge, Assistant in Agronomy.

PAMPAS-GRASS AND TOETOE.

EXPERIENCE WITH PAMPAS AS WINTER FODDER.

B. C. ASTON, Chief Chemist, Department of Agriculture.

THE note on toetoe, or New Zealand plume-grass, published in this *Journal* for December, 1931, has resulted in the writer's attention being drawn to an interesting farming development with South American pampas-grass on the Hauraki Plains.

Pampas-grass, *Gynerium (Cortaderia) argenteum*, according to Cheeseman ("Manual," 1925) has established itself as a garden escape in the vicinity of Auckland and is spreading in waste places, railway cuttings, &c. It is thus a naturalized New Zealand plant, and it would appear from what follows that it is worthy of considerable attention by farmers on reclaimed swamp-land who are looking for a supplementary cattle-fodder that will never fail them. Gynerium is a genus of grasses belonging to the tribe Arundineae, and distinguished chiefly by the species having showy flower panicles. Six species are recognized, most being natives of Brazil and Chile. That which is best known and cultivated in Britain and New Zealand is *G. argenteum*, called pampas-grass because it is a native of those vast plains, the pampas of South America. It is usually planted in Europe in gardens for the ornamental effect given by the splendid plumes. It was first introduced into Britain in 1843, and distributed from the famous Glasnevin Botanic Garden.

Von Mueller ("Select Plants for Industrial Culture," 1895) refers to the pampas-grass of Uruguay, Paraguay, and La Plata States as an industrial plant because paper can be made from its leaves, as first shown by him. Toetoe is not quite so hardy as pampas, but still stands considerable frost. Buchanan ("Manual of Indigenous Grasses of New Zealand," 1880) states that rough forage can be obtained from the leaves of toetoe, particularly from plants of the succulent variety. He says that the economic value of the plant has been much overlooked, for if it is cut when in flower the leaves will be found both succulent and agreeable to stock. Experiments made on the allied pampas-grass by Sir George Grey at Kawau and Dr. S. M. Curl in the Manawatu favour the view that these coarse grasses have been neglected, and that they only require to be cut down at the proper time to ensure that stock will eat them greedily.

Dr. Curl (Transactions of the New Zealand Institute, 1876) states that pampas-grass reaches a height of 10 ft., but if within reach of stock they keep it low, being particularly fond of its rather coarse leaves, which contain a large amount of nutriment and grow through both winter and summer, cold having little effect, and as the young leaves appear all cattle and sheep will quickly eat them, leaving more delicate herbage to do so. Weathers ("Practical Guide to Garden Plants," 1901) states that pampas likes a good supply of water during the summer months. He says that pampas varies a good deal in character, which suggests that by selection better strains for grazing might be obtained. Propagation is easily effected by dividing tufts in spring, replanting them in light rich soil, and watering freely.

Hauraki Plains Farmer's Experience.

Mr. A. McClean, of Waitakaruru, Hauraki Plains, wrote in July last that he had been for six years carrying out practical trials using pampas-grass as an auxiliary fodder for stock, particularly dairy cattle, and had obtained results which he considered most satisfactory. The results had also convinced him and others who had seen the plantations that there were great possibilities in the use of this plant, especially as a winter fodder. An analysis of pampas-grass was given in the December *Journal* article for comparison with toetoe, oaten hay, &c., with which it compared favourably. Mr. McClean's attention was first called to the matter from the fact that cattle liked the pampas-grass, and each year he kept on increasing the plantations until to-day he has 9 acres under pampas, and this is his second year of wintering stock on this grass.

FIG. 1. PAMPAS-GRASS ON MR. McCLEAN'S FARM AT WAITAKARURU.

The tussocks were two years and eight months old from date of planting when photo was taken last May.

The accompanying photographs are by Mr. McClean, who states that his results obtained over the past three years show that he can carry on his farm of 200 acres (including 30 to 40 acres in a rough state) 200 head of cattle the whole year round. He does not need hay or any supplementary fodder, for the simple reason that the animals ignore hay if they can get pampas-grass, and they certainly do much better on the latter. His cattle are in excellent condition and keep remarkably healthy. Test cows which have spent four winters on pampas are to-day the outstanding animals on the farm, with coats and condition as if fed on linseed.

Cattle eat the pampas down themselves in breaks with a movable fence; it does not need to be cut for them. Mr. McClean has tried cutting and feeding out the pampas like other crops, but there seems to be too much wastage of material, and cattle certainly prefer grazing

the standing tussocks. This method is very economical of farm labour, only half a day per week being employed in arranging for 100 to 150 giant tussocks to be fed off, whereas feeding hay and ensilage means a daily job. Pampas grows very rapidly, approximately 1 ft. a month, until in twelve months' time each clump has about 1 cwt. of fodder.

Samples of pampas forwarded from Hauraki Plains have been analysed, and the results calculated on the green material are tabulated below, together with analyses of toetoe, green maize, and oats for comparison. The figures in parentheses are the constituents calculated on the dry matter.

	Water. Per Cent.	Ash. Per Cent.	Protein. Per Cent.	Phosphoric Acid. Per Cent.
Pampas-grass	71·4	2·27 (8·16)	2·46 (8·71)	0·1 (0·36)
Toetoe	..	.. (8·86)	.. (7·13)	.. (0·25)
Green maize	81·0	3·0 (15·0)	1·9 (9·37)	0·12 (0·62)
Green oats	82·2	1·6 (8·9)	2·7 (15·7)	0·15 (0·84)

Mr. McClean describes his farm as good swamp-land, and the photo (Fig. 1), taken in May, shows the watertable to be very near the surface. The quality of the soil affects the feeding value of a given species of pasture plant much more than is generally recognized, and it may be that pampas is exceptionally digestible and palatable when grown on a drained swamp of similar type to that of the Hauraki Plains, a warm soil well supplied with organic matter and water (for analysis see this *Journal* for June, 1914, p. 565). One would like to hear of instances of cattle grazing pampas-grass on other types of soil, as, if the utilization of this plant is generally applicable on all soils as a supplementary fodder for cattle, a great economy of pasture and of expense in growing ordinary supplementary fodders might often be effected. Even if it is only found possible to utilize swamp-lands in this way, it will be an opening for the use of a species which is now regarded as a shelter and ornamental plant.

The chemical analyses indicate that toetoe and pampas-grass are of relatively good value when compared with other green fodders—that is, if the components are equally digestible. That toetoe is extremely palatable to stock is shown by the manner roadside tussocks are grazed back in winter in the Hawke's Bay district, but if some assistance were given stock in detaching the saw-edged leaves from the tussocks, no doubt very much better utilization could be effected. Both these giant-tussock plants are quick growing.

FIG 2. COWS FEEDING ON PAMPAS IN ONE OF MR. McCLEAN'S PLANTATIONS.

"DELICIOUS SPOT" ON APPLES DUE TO *GLOEOSPORIUM PERENNANS.*

R. M. BRIEN, Mycological Laboratory, Plant Research Station, Palmerston North.

"DELICIOUS SPOT," an apple rot common to the variety Delicious, first became conspicuous in New Zealand in 1923. In that year in one line of several hundred cases, some showed as much as 60 per cent. of infection. Since then the disease has been prevalent each season in Delicious and other varieties taken from cool stores throughout the Dominion. It is essentially a storage condition, being present only on apples held in cool storage and on those kept in packing-sheds over an extended period.

Cunningham in 1923 recorded the disease under the name of "Delicious spot," but did not identify the causal organism. During the 1930 and 1931 seasons an extensive study of the fungi causing apple and pear rots in cool storage was undertaken in this Laboratory. Specimens were forwarded by the Orchard Instructors, who secured them from the main cool stores throughout the Dominion. Approximately two hundred isolations were made from apples infected with "Delicious spot," and every isolation was found to resemble closely *Gloeosporium perennans* Zeller and Childs.

This fungus was recorded by Zeller and Childs in 1925 as the cause of a perennial canker on apple-trees in the States of Oregon and Washington, and in British Columbia. These authors did not at that time consider the fruit rot produced by this organism to be of definite economic importance. In 1931 it was recorded by Heald and Ruehle as causing a "bull's-eye" rot on apples in Washington State, chiefly on Jonathan, Yellow Newtown, and Spitzenburg, and to a lesser extent on Rome Beauty, Winesap, and Delicious from other localities. In New Zealand the fungus has been obtained principally from Delicious and Sturmer, and to a lesser extent from Rokewood, Statesman, and Washington apples. The same type of rot was observed on a few specimens of Twyford Monarch and Winter Cole pears from cool storage.

The relative percentages of infection in five varieties of the diseased specimens forwarded are as follows: Delicious, 68·1; Sturmer, 29·3; Washington, 1·2; Rokewood, 0·9; and Statesman, 0·5. The disease would appear to be general throughout, since specimens were obtained from cool stores in the districts of Auckland, Gisborne, Hastings, Greytown, Nelson, Motueka, Stoke, and Christchurch. Lines from which these fruits were secured were held in stores for periods varying from four to seven months.

METHODS OF INFECTION.

Gloeosporium perennans usually penetrates apples through mechanical injuries and necrotic areas, although in some cases infection takes place on sound fruits. Injuries causing stem and calyx infection, and induced by stem, skin, and insect punctures, and to a lesser extent through russeting, sun or spray burns, and branch wounds, are the usual modes of entrance, although under favourable conditions infection

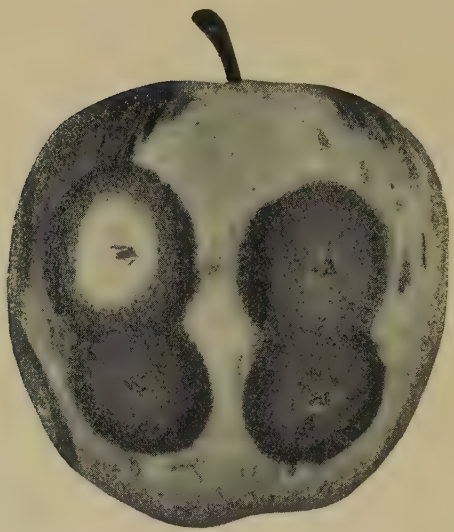

FIG. 1. LESIONS OF GLOEOSPORIUM PERENNANS ON INOCULATED DELICIOUS APPLE. NATURAL SIZE.

FIG. 2. LESIONS ON INOCULATED STURMER APPLE. NATURAL SIZE.

[*Photos by H. Drake.*

occurs by way of the lenticels. In one batch of thirty-two diseased fruits forwarded from a Gisborne cool store the fungus had infected twenty-two in this manner.

Symptoms produced.

The disease is noticeable first as a small, slightly depressed, light-brown or chocolate coloured spot, approximately 2 mm. in diameter. When the lesion enlarges to 6–8 mm. the centre becomes yellowish-brown, the periphery remaining chocolate-brown. These are marked by zones, the peripheral zone being approximately one-sixth of the diameter. The size of the spots varies; on fruits held in cool storage from four to five months they may attain 30–35 mm. in diameter. At first the lesions are firm, but they become spongy when mature. They are usually circular in outline except where they coalesce. Fructifications are present only on mature spots, when the acervuli form sub-epidermally and exude spores in dark cream gelatinous tendrils. The number of spots per fruit varies, for where severe infection has occurred by way of the lenticels they may appear in abundance and scattered over the epidermis. On the other hand, where infection has taken place through skin injuries or insect punctures, only one or two lesions may develop. Penetration occurs to a depth of 8 to 18 mm.

Inoculation Tests.

Inoculations were first carried out in November, 1931, on Sturmers which had been in cool storage for five months. Six cultures of *Gloeosporium perennans* were obtained from infected fruits. Apples free from rots or blemishes were surface sterilized with acidulated mercuric chloride (1–1000) for four minutes, and then washed in sterile water for ten minutes. Spores and mycelium were inserted into incisions made by a sterile scalpel, and the apples were placed in glass jars fitted as moist chambers and kept at a temperature of 10–20° C. Lesions identical with the originals developed from all six cultures.

During the present year a further series of inoculations has been carried out with Jonathan, Cox's Orange, Delicious, and Sturmer. These were inoculated by the above method every two months, from time of picking till completion of storage. After thirty days typical lesions were formed round points of inoculation on all varieties. This was the case for each set of inoculations irrespective of length of storage. On freshly picked fruits of Delicious and Sturmer lesions developed rapidly, reaching 22–26 mm., and on Jonathan and Cox's Orange 10–12 mm., in the same time. At later stages of storage there was no appreciable difference in the sizes of lesions. The spots formed were identical on all varieties. Reisolations were made from each set of inoculations, and typical cultures of the fungus secured.

Morphology.

Cultures isolated from apples in New Zealand agree closely with those secured from Zeller, and also with the original description given by Zeller and Childs. The morphology of the New Zealand organism is cited here, since the original paper is not procurable in the Dominion. The description was drawn from fructifications on inoculated apple fruit.

Gloeosporium perennans Zeller and Childs. Oregon Agricultural College Experiment Station Bulletin 217, pp. 1–17, 1925.

Acervuli erumpent, circular, white to light-brown, 400–700 microns in diameter. At first composed of an erect cylinder of sterile hyphæ which is later surrounded and enclosed by conidiophores. Conidiophores branched, divergent, septate, hyaline.

Conidia hyaline, one-celled, mostly cylindrical, sometimes curved, larger at one end, acuminate, 10–18 × 3–4, average = 12·6 × 3·1 microns, producing secondary conidia in culture.

Secondary conidia hyaline, one-celled, ovoid, sometimes curved, 3–7 × 1–2 microns.

Habitat: On apple fruits in New Zealand and branches of *Pyrus malus* and *P. communis* in United States of America (Zeller and Childs l.c.).

Distribution: United States of America, Western Canada, and New Zealand. In New Zealand common on stored apple fruits throughout.

Summary.

(1) "Delicious spot" is one of the most serious types of decay on cool storage apples in the Dominion.

(2) It is caused by the fungus *Gloeosporium perennans* Zeller and Childs.

(3) Inoculations with spores and mycelium on Delicious, Sturmer, Cox's Orange, and Jonathan proved positive on all four varieties.

(4) The fungus is able to attack these varieties at any stage in their storage.

(5) Infection takes place through wounds, insect punctures, or directly by way of the lenticels.

(6) The symptoms and morphology of the New Zealand organism are described.

The writer wishes to thank the Orchard Instructors in the various districts who forwarded specimens for this investigation, and Mr. H. Drake for preparing the photographs.

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Zeller, S. M., and Childs, L.: Perennial Canker of Apple Trees, Oregon Agr. College Exp. Sta. Bull. 217, pp. 1–17, 1925.

Heald, F. D., and Ruehle, G. D.: The Rots of Washington Apples in Cold Storage. State College of Washington Agr. Exp. Sta. Bull. 253, pp. 13–17, 1931.

Conversion of Unprofitable Apple-trees.—A good example of converting unprofitable trees to another variety by the "refurnishing" system is reported by Mr. G. Stratford, Orchard Instructor, Motueka, as follows: "An orchardist on the Moutere Hills concluding that his Ribston Pippin trees were not profitable to grow, decided to work them over with Cox's Orange Pippin. After explaining to him the advantages, he decided to adopt the refurnishing system instead of the orthodox method of grafting. The leaders were stripped quite bare during the pruning season, allowing new shoots to push out all along the leaders during the following growing season. These new shoots were then budded during February, putting in anything from 150 to 200 buds per tree. The leaders were also cut back the required length and Cox's Orange Pippin scions grafted on the ends. Convenient subleaders were similarly grafted. The result was a splendid take with practically all buds and grafts, and it is anticipated that in two years' time the grower will have large Cox's Orange Pippin trees in good bearing. Probably some trouble will be experienced for a time with growths from Ribston buds, but these can be suppressed during the season." It is understood that a similar system has been practised in Tasmania and other Australian States.

INSECT TRANSMISSION OF DRY-ROT (*PHOMA LINGAM*) OF SWEDES.

W. Cottier, Entomology Section, Plant Research Station, Palmerston North.

The following account deals with work carried out subsequently to that described in this *Journal* for September, 1930, in which it was shown that dry-rot of swedes had been carried from various sources to healthy bulbs by two insects which at that time were unidentified. These have now been named, and they are the Staphylinid beetle *Athela pseudocoriaria* Bernh. and the Drosophilid fly *Drosophila rubrostriata* Beck.

After the conclusion of the preliminary investigation it was decided that it was necessary to carry out a survey of the insects characteristically found in rotting swedes. Since the disease appears to be mechanically carried, the purpose of this was to select the most abundant and likely two for further experiment, as it would have prolonged the work unnecessarily to examine the transmitting powers of all the fauna characteristically found. As it happened, these two insects proved to be *Athela pseudocoriaria* and *Drosophila rubrostriata*, and this paper deals with further work performed with them to demonstrate conclusively that insects carry dry-rot.

Experimental Methods and Results.

The swedes used in the experiment described below were grown from seed treated against dry-rot on new ground at a special isolation block at Tangimoana where there were no other swedes for miles around. When they were a suitable size these bulbs were transferred to the laboratory and transplanted into thirty-six boxes each 18 in. by 12 in. by 6 in., placing five bulbs in each box in the manner shown in Fig. 1. Before use the boxes and soil were steam-sterilized at 98° C. for twenty minutes. Each box was provided with a wire frame over which was placed a fine mesh muslin cage as shown in Fig. 2. The muslin was glued to the box below and secured tightly above with string, so that the apparatus was insect-proof. Each box was placed in a tray as shown in Fig. 2, and the watering was thus done from below, so that there was no possibility of the spores being carried from one bulb to the other by this means. In the handling of the bulbs all care was taken to prevent accidental contamination.

Before being placed in the box cages each bulb was carefully fumigated with a heavy dose of nicotine sulphate, then cleaned, thoroughly washed in acidulated mercuric chloride solution (1–500), and subsequently carefully washed with clean water to make sure the chemical was removed. After the bulbs had been dried and arranged in the box cages the central swede in each box was inoculated with a virulent strain of the dry-rot organism from laboratory plate cultures. All the box cages were then placed on the concrete floor of an insect-proof glasshouse to wait for the disease to develop in the inoculated bulbs.

The insects used were taken from cultures bred up in the laboratory. These cultures originated from flies and beetles collected in the field

FIG. 1. SHOWING ARRANGEMENT OF THE SWEDES IN EACH BOX CAGE.

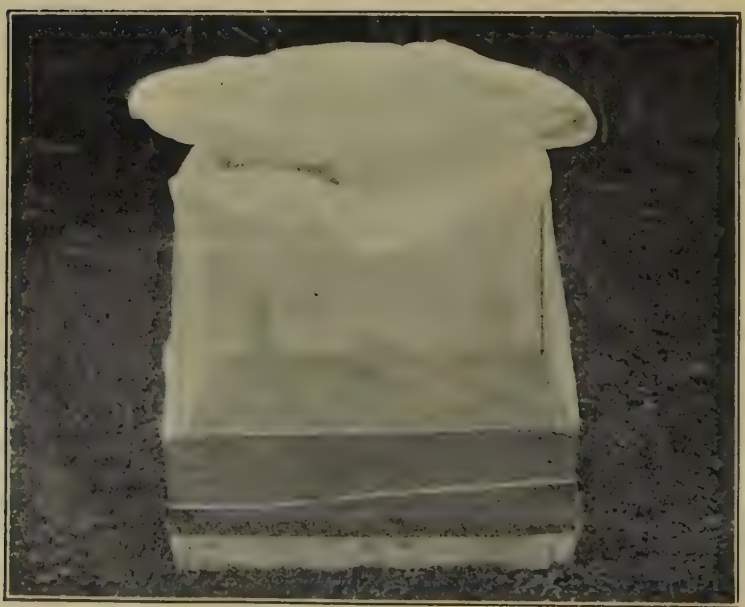

FIG. 2. BOX CAGE WITH WIRE FRAME AND MUSLIN COVER.

[*Photos by H. Drake.*

and placed in clean jars containing rotting potatoes which had been inoculated with "blackleg," a bacterial disease. The *Atheta pseudocoriaria* used in the actual transmission work had been bred on the potatoes for at least one generation; such was the case also with *Drosophila rubrostriata*. In this way insects free from contamination with dry-rot were secured, which condition was desirable since the purpose of the experiments was to demonstrate the carriage of the disease from the central bulb to the other bulbs in the box cage.

Approximately fifty days after the central bulbs had been inoculated, dry-rot had fully developed in them, and insects were placed in the box cages as follows: (*a*) Into the first lot of six box cages were placed adults of *Atheta pseudocoriaria* (bred on rotted potatoes) at the rate of approximately forty per box. The bulbs in these boxes, except the central ones, were chipped with a sterilized knife in five places. This was done to discover whether the insects transmitted the disease to damaged bulbs more readily. (*b*) Into the second lot of six box cages were placed adults of *Atheta pseudocoriaria* (bred on rotted potatoes) at the rate of approximately forty per box; these bulbs were undamaged. (*c*) Into the third lot of six box cages were placed adults of *Drosophila rubrostriata* (bred on rotted potatoes) at the rate of approximately forty per box; these bulbs were damaged by chipping as in (*a*). (*d*) Into the fourth lot of six box cages were placed adults of *Drosophila rubrostriata* (bred on rotted potatoes) at the rate of approximately forty per box; these bulbs were undamaged. (*e*) The fifth and sixth lots of six box cages remained without insects of any kind, to act as controls. During the experiment the leaves of all the swedes were kept short (see Fig. 1) with sterilized instruments to prevent any contamination by contact with other bulbs.

As rot (dry-rot, soft-rot, fusarium-rot, &c.) appeared in the bulbs round the central infected one, such diseased swedes were removed for the purpose of culturing the fungus and verifying the identification in the laboratory. It was necessary to remove these bulbs as the disease appeared, because if they were left other fungi entered the rotting material and made the identification of dry-rot very difficult. The process of removing the bulbs was as follows: Before the box cages were touched the operator's hands were washed in mercuric chloride solution (1–500). The top of the cage was then loosened and the hands, holding a cloth soaked in mercuric chloride solution (1–500) were inserted carefully into the box-cage so that no insects could escape or enter. The diseased swede was carefully loosened, but before being lifted from the surface of the soil it was wholly enveloped in the sterilized cloth mentioned above. In this state it was withdrawn from the cage very carefully so that no accidental contamination of the other bulbs could take place.

Quite a large percentage of the bulbs in the box cages became infected with soft-rot (probably bacterial) and fusarium-rot, and it became desirable to replace such diseased swedes with healthy ones. The remaining bulbs taken from the isolation area at Tangimoana were not sufficient for this purpose. Accordingly the diseased bulbs were replaced with healthy ones taken from a block grown on new ground at the Plant Research Station's experimental area. This crop was grown from seed which had been treated against dry-rot. Very little disease subsequently appeared in this crop, and then at a very late date, many weeks after the experiments in the glasshouse were finished.

All the work was carried out in an insect-proof glasshouse, steam-heated. During the experiments, the average air temperatures were maximum, 82° F., minimum, 45° F.

Results are shown in the following table :—

Table 1.—Experiments with Insects introduced into Box Cages on 19th May, 1931, at Rate of approximately 40 Adults per Cage.

Box Cage.	Condition of Bulbs.	Number of Bulbs developing Dry-rot, and Date of Appearance of Disease.*
	Drosophila rubrostriata.	
C	Undamaged	..
D	,,	1 on 18th August.
E	,,	1 on 13th July.
F	,,	1 on 13th July ;
		1 on 27th July.
G	,,	..
H	,,	..
J	Chipped	1 on 30th June ;
		1 on 27th July ;
		1 on 3rd August ;
		1 on 17th September.
K	,,	..
L	,,	1 on 30th June.
M	,,	1 on 30th June ;
		1 on 3rd August.
N	,,	..
O	,,	1 on 30th June ;
		1 on 10th August ;
		1 on 18th August.
	Atheta pseudocoriaria.	
P	Undamaged	..
Q	,,	..
R	,,	..
S	,,	..
T	,,	..
U	,,	..
V	Chipped	1 on 7th July ;
		1 on 13th July.
W	,,	2 on 30th June.
X	,,	1 on 20th July.
Y	,,	1 on 20th July ;
		1 on 10th August.
Z	,,	..
A	,,	3 on 7th July ;
		1 on 8th August.
	Control (No Insects).	
Control A	Undamaged	..
,, B	,,	..
,, C	,,	..
,, D	,,	..
,, E	,,	..
,, F	,,	..
,, G	,,	..
,, H	,,	..
,, J	,,	1 on 18th August.
,, K	,,	..
,, L	,,	..
,, M	,,	..

* These do not include the central bulbs of the box cages, which were artificially inoculated.

Discussion and Conclusion.

Owing to an accident, dry-rot bulbs taken from box cages J, M, and O (one from each) were replaced with bulbs taken from the field. In these three cases contamination of the three new bulbs may have taken place from the soil, so that in a perusal of the table this should be borne in mind.

As additional evidence that dry-rot was not brought into the box cages by means of the bulbs taken from the field and used to replace those which went off with soft-rot, it may be stated that the percentage of bulbs replaced in the control boxes from the field was 23, that in the insect-boxes 35, while the percentage of dry-rot that subsequently developed in the control boxes was only 2, whereas in the insect-boxes it was 26. A further illustration is afforded by the following: In the six box cages containing *Drosophila rubrostriata* with undamaged bulbs four swedes developed dry-rot while five bulbs had been taken from the field to replace those which developed soft-rot. In the six box cages containing *D. rubrostriata* with chipped bulbs, ten swedes developed dry-rot while eighteen bulbs had been taken from the field to replace those which developed soft-rot. In the box cages containing *Atheta pseudocoriaria* with undamaged bulbs none developed dry-rot, while four had been taken from the field to replace those which developed soft-rot. In the six box cages containing *A. pseudocoriaria* with chipped bulbs, eleven swedes developed dry-rot, while seven had been taken from the field to replace those which developed soft-rot. In the twelve box cages of the controls, all the bulbs of which were undamaged, one swede developed dry-rot while eleven had been taken from the field to replace those which developed soft-rot.

Apart from the possibility of carriage by insects, birds, animals, &c., Cunningham (1927) showed that spores are disseminated only by rain or by actual contact, and that wind plays only an indirect part in that it brushes the leaves of a healthy plant against the diseased tissue of an adjacent one. The factors of wind and rain can of course be ruled out in these glasshouse experiments. The bulbs were watered from the bottom in trays so that there was no possibility of spore dispersion by water splashing, and at no time could the conditions in the box cages be called wet so as to produce abundant spore tendrils. The soil was kept just moist enough to provide the bulbs with enough water to keep them healthy. The leaves were kept cut right back so that there was no chance of contact by this means, and careful precautions were taken at all times to prevent accidental contamination by manipulation.

The only possible conclusion, then, is that the disease was carried from the diseased bulbs to healthy ones by the insects introduced into the box cages. From a perusal of Table 1 it will be seen that dry-rot was transmitted much more freely among the chipped than among the undamaged bulbs. This can be easily understood, because these injuries are the easiest places for the fungus to enter the bulbs after the spores have been deposited by insects wandering over the surface. This demonstrates the importance of avoiding as much injury as possible to swedes during cultivation, &c. Table 1 also shows that *Drosophila rubrostriata* transmitted more disease than did *Atheta pseudocoriaria*.

This also is easy to understand, on account of the mode of travel of the two insects. *Drosophila rubrostriata* will fly from one bulb to the other, whereas *Atheta pseudocoriaria* prefers to walk, taking to the wing only occasionally. Thus the first-named insect will make many more trips from the diseased bulbs to the healthy ones than will the other, in a given space of time.

It should be understood that although these two insects would seem to be the most important in the transmission of dry-rot, they are only representatives of the insect fauna of a dry-rotted swede, and possibly any of the typical insects of the diseased bulb would prove capable of this transmission to a greater or lesser degree, according to their habits.

The experiment has clearly demonstrated that dry-rot of swedes can be carried by insects, particularly to injured bulbs.

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WINTON DEMONSTRATION FARM.

NOTES ON THE 1931–32 SEASON'S WORK.

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NOTWITHSTANDING the low prices ruling for both dairy-produce and stock, the policy of establishing the dairy herd adopted by the committee of the Winton Experimental and Demonstration Farm some three years ago has not been interfered with to any great extent, and its continuance was one of the main features of the past season's work.

Besides carrying on those experiments already in existence, many new ones were laid down. Unfortunately a period of twelve weeks almost without rain at a most critical period was responsible for poor germination and consequent failure of many trials which would otherwise have proved of great interest to the district. The management of the pastures, exemplified by their freedom from roughage and their cleanliness, is a striking testimony to the benefits to be derived from the practice of rotational grazing.

ROTATIONAL GRAZING.

Blocks 2, 4, 8, and 10, which were devoted to rotational grazing in the 1930–31 season, were again utilized for the same purpose. The area constitutes 20 acres, comprising eight 2½-acre fields. (see *Journal*, December, 1930, page 407). These fields were top-dressed with superphosphate at the rate of 3 cwt. per acre in the autumn, and four of them received an additional dressing of sulphate of ammonia at the rate of 1 cwt. per acre. Owing to the dry conditions, growth was never prolific at any period of the year, and it was only by constant harrowing, sometimes as many as three harrowings per field per month, that it was possible to milk forty-three cows and carry young stock on 40 acres of

grass. Daily records of grazing and weight of milk produced have been recorded. The experiment has been inspected regularly by many local farmers who were greatly impressed not only by seeing forty-three milking cows grazing on a 2½-acre field, but by the management of the pastures reflected in the vast difference in appearance and growth brought about by systematic harrowings.

The Stock.

Prior to enumerating the stock, it may be noted that the farm's total area is 91 acres. Of this just over 40 acres were down in grass, the remainder being sown in oats and grass and general winter feed. It was the committee's intention to increase the previous season's herd of thirty-two cows to fifty, and although this was not achieved a gradual increase brought the number of cows in milk to forty-three. The herd consists of grade Friesians, and has given fairly satisfactory results. With the object of raising the butterfat averages the herd was entered under the Otago and Southland Herd-testing Association, and the last test, dated 31st May, 1932, showed that the herd average was 239·17 lb. of butterfat in 219 days for forty-one cows, while for last season the average was 236·20 lb. in 216 days for thirty cows.

In addition to the dairy herd, eighteen heifers that were raised on the farm were put to a young purebred Friesian bull of well-known butterfat backing, and it is hoped to bring these heifers into the herd in October. Sixteen heifer calves selected from the best cows in the herd have been reared. These will be carried on through the season with the intention of bringing younger stock of known origin into the herd at a later date.

Red Polls: The bull, two cows, and two calves were sold in the early part of the season, this breed being deemed not suitable for local conditions.

Rye-grass Strain Investigation.

This trial, embodying some 200 plots of rye-grass from various parts of New Zealand, was sown down in October, 1929. Observations have been recorded at regular intervals on the establishment of the various strains, and botanical analyses of the plots have been made annually. To the casual observer the difference in the pasture establishment is very evident. It is now two years and a half since the plots were sown and the proportion of rye-grass in the plots sown with Hawke's Bay seed is practically the same as it was in its first season. Such is not the case with the remaining plots of Southland and Canterbury rye-grass; the proportion of rye-grass now in these is very low, and their bareness showed up to such an extent in the early part of the season that it was found necessary to affix to the notice-board a metal container with a complete plan of the experiment, to allay the curiosity of visitors.

Cocksfoot, Red Clover, and White Clover Strains.

A trial similar in layout to the rye-grass experiment was sown in 1929. A line of perennial rye-grass from Hawke's Bay was used as a base, to this being added for each plot a strain of cocksfoot or clover. Records have been kept as to the establishment, grazing, and growth of the various plots. A summary of the observations shows that the establishment of cocksfoot has been poor. The red clovers established

to a fair degree, the most noticeable being Montgomery Red, which has withstood ordinary farm grazing conditions to a remarkable degree. Many of the white clovers show good establishment, foremost among these being a selected line from Hawke's Bay (A.C. 311), while another exceptionally good plot, No. 40, a Kentish white clover (A.C. 109). Comparing these plots with the Danish white, which has practically disappeared, and the imported white, which is equally poor, it is easily inferred that New Zealand has a white clover greatly superior to most of the imported lines.

Trials with Cruciferous Crops.

Block 15, which had been in turnips and swedes for two seasons, was again ploughed in December for turnips. This area was known to be badly infested with club-root.

A turnip manurial trial, embodying basic slag, super, and super plus lime, was laid down during dry weather, but faulty germination resulted in the abandonment of it from an experimental point of view. Adjoining this trial, five replications, 3 chains long, of Bruce Purple-top turnip, Bruce Green-top, and Hardy Green Globe were sown. It was noted throughout the season that both types of the Bruce turnip were very vigorous growers. At a farmer's field-day on 6th April a portion of each drill of the trial was pulled, and it was clearly seen that the bulbs of the Bruce turnips were free from club-root, though some had slight infection of the roots. In the case of the control plot, Hardy Green Globe, it was seen that the bulbs had over 90 per cent. infection. In May, prior to feeding off the block, a club-root count was taken, and the average of a series showed that infection on bulbs was Bruce Purple-top 16 per cent., Bruce Green-top 18 per cent., and Hardy Green Globe 96 per cent. Infection of roots was Bruce Purple-top 34 per cent., and Bruce Green-top 60 per cent. (very slight infection).

Ten replications of fourteen varieties of swedes were sown in November, but germination was very irregular; it was found that some of the seeds germinated forty-one days after sowing. From a yield point of view the trial was worthless, but considerable interest was evinced by the farmers who inspected the crop for shape and type. Among these varieties the Herning was in evidence, and contrary to the usual assumption that Herning is a poor yielder many bulbs weighed 15 lb. to 17 lb. and were of good shape, with no indication of club-root. Another swede, Sutton's Green-top, was noted more for prolific growth of top than for its size of bulb. It is thought that this swede, which makes rapid growth, would do well for lamb feed. The Central Otago swede, Hunt's Superlative, has grown very well, and compares very favourably with commercial strains of Superlative.

A swede manurial trial, with ten replications of six different types of fertilizer, was sown in mid-November. This suffered in the same manner as others in the matter of germination, and so proved of little account from an experimental point of view.

Forage Crops.

Uneven germination nullified a forage-crop trial with kohl rabi, broad-leaf Essex rape, Kangaroo rape, thousand-headed kale, Maori cabbage, and chou moellier, also a manurial trial on chou moellier. In

spite of these adverse conditions and the resowing of many of the trials a sufficiency of winter feed was provided for the stock. A splendid crop of chou moellier standing 4 ft. to 4 ft. 6 in. high, with some stems 3 in. in diameter, proved a valuable asset in maintaining the milk-supply. The swede crop averaged 40 to 45 tons per acre.

Potato Trials.

Continuing the origin of seed trial with the seed from the previous year's test, a small area was planted in October. This was harvested in April, and a quantity of seed sent to Canterbury for a comparative trial there. Sufficient seed was retained on the farm to plant the present season's trial, which will conclude this experiment. From these results it is hoped to obtain some definite information as to the districts most suitable for the production of seed potatoes.

Miscellaneous.

Blocks 14 and 15, comprising over 22 acres, were sown down in oats and grass in November, the grass mixture being certified rye-grass first harvest seed, timothy, crested dogstail, New Zealand white clover, Montgomery red clover, and cow-grass. The oats were cut green and converted into hay. The strike of grass was very good. After the oat crop was cut, the fields were top-dressed with 2½ cwt. of super per acre. A new windmill and concrete trough were erected on the dividing fence in a convenient site for the subdivision of these blocks.

Half of Block 15, which surrounded the dismantled meat-works, was ploughed with a swamp plough in May, and the ridge on the block has since been planted with trees.

Throughout the season the Winton Experimental and Demonstration Farm Committee acted under the guidance of the re-elected chairman, Mr. D. H. McLean, of Caroline. The practical work in connection with the numerous experiments has been in the capable hands of the Manager, Mr. G. L. Smart.

A SYSTEM FOR SELECTING VARIETIES OF FRUIT-TREES.

M. Davey, Orchard Instructor, Mapua, Nelson.

The selection of fruit-tree varieties is one of those matters which exercises the minds of most commercial fruitgrowers, and often, despite much thought, leaves the solution in a state of uncertainty. Orchard Instructors are frequently called upon to make recommendations in this direction, and without some system of appraising the various values which may be attributed to the various varieties it may prove unsatisfactory to tender advice.

In order that some reasonably sound base may be available the writer suggests the employment of a pointing system which should, independent of changing conditions, arrive at a fairly correct selection. The headings under which such points could be awarded together with the maximum scale, might be as follows: Ruling market values of variety, 25 points; comparative yield, 10; freedom from disease, pests,

and rejects, 20; quality for dessert, 10; suitability for cooking, 10; harvesting and packing, 5; constitution and vigour of tree, 5; storage life of fruit, 15: total, 100 points.

These points are intended to suggest approximate value, and can be adjusted to meet the personal opinion of individual growers. It must be remembered that localities and local conditions have an important bearing on the various factors.

The following comments on the values scheduled may be of assistance in arriving at a decision:—

Ruling Market Values.—A careful perusal and analysis of account-sales, pool averages, and other returns which become available should be made in establishing this point. Potential value should also have a bearing on the matter. Note should be made of the upward or downward trend of any one variety, using a graph system over a period of not less than three seasons.

Comparative Yield.—This should be arrived at by a comparison of the crop production over a period of, say, five years, records to be applied to trees of approximately the same age. One should not depart from the practice of comparing dessert varieties with dessert varieties and cooking varieties with cooking varieties, otherwise the position becomes much more involved.

Freedom from Disease, Pests, and Rejects.—There is little doubt that this aspect is uppermost in the minds of most growers in selecting varieties for either planting or reworking; but it is as well that something more than a mental analysis be made. Annual records should be kept of the fruit passed through the packing-shed, and the amount of each variety discarded as unfit for local or export markets. The writer is conscious of the fact that it is not practicable to keep a record of the fruit affected under the different causes of rejection, but even this can be mentally and fairly correctly assessed by the grower and recorded in proportion to the total rejects.

Quality for Dessert.—Although this matter may be subject to individual tastes, the orchardist himself should be a first-class judge of quality in a dessert apple. If the grower's personal taste is too pronounced in one direction, outside opinions on this point are not hard to obtain. Size and appearance should also be taken into consideration in assessing the value of a dessert apple or pear.

In regard to size, particular markets may prefer a very different range; therefore a mean or average size for the markets served should be the aim in the mind of the grower. Regarding appearance, pronounced bright colour, be it red or yellow, combined with refinement of shape, is most appealing to the consumer, whether it be on the table, in the shop, or on the advertising poster.

Suitability for Cooking.—With regard to apples or pears for culinary purposes, again individual tastes differ, some consumers preferring an apple which breaks down in the process of cooking. Size has a bearing on this aspect. Generally speaking, the largest varieties with low sugar content, such as Ballarat Seedling and Dunn's Favourite, are in the class which breaks down on cooking. This class of fruit is more suitable for baking. In Britain and possibly on the Continent a much larger proportion of apples are served in this form than in New Zealand. It is fairly safe to state that the majority of consumers

prefer an apple which cooks thoroughly and still retains the shape to which it has been divided. The preference of the canning factory seems to give a lead in this direction.

As with the dessert varieties, size and appearance also count with the buyer; invariably large sizes appeal for cooking, as less waste and time is entailed in preparing for the table. Under appearance a clear skin, be it green or yellow, is the most sought for. Russet and blemish greatly discount the face value of a cooking-apple, a fact which is possibly not fully appreciated, but which has to be recognized.

Harvesting and Packing.—Under this heading are features which possibly do not receive as much consideration as is warranted. Size of the variety may be partially covered by yield, but the cost of harvesting and packing small or large varieties is far apart. An endeavour should be made to avoid selecting varieties which are naturally very small. If ultimately the selling of apples and pears by count becomes a general practice this feature may be somewhat discounted, but the relatively high cost of harvesting and packing small apples or pears will remain.

Period of ripening should also be considered in conjunction with operation of the packing-shed. It is undoubtedly very desirable that a succession of ripening periods be aimed at for the convenience of packing and shipping. If more thought could have been given to this aspect at the time of planting most of the commercial orchards, a great deal of anxiety to which growers are now subject would have been avoided.

Constitution and Vigour of Tree.—It is inevitable that considerable loss of revenue must eventuate where trees in full bearing are cut down and reworked. Therefore a quick recovery is most desirable, and varieties which are not only vigorous and lend themselves to light pruning, also those which are precocious in forming fruit buds, should be selected. Possibly the outstanding variety of apple to which this description may be applied is Desert Gold. The writer's experience is that this variety is best dealt with by light pruning after the second year from reworking, and that under such treatment it will not only grow vigorously, but will also carry considerable fruit on one-year-old wood. Trees lacking in natural vigour are invariably below average size, which automatically reduces their carrying-capacity, and in addition generally demands special attention with regard to fertilizers, which entails extra cost of production.

Storage Life of Fruit.—This factor is gradually being minimized by improved methods of handling and refrigeration. However, too large a quantity of fruit is still classed on the markets as wasty. This condition depreciates the value of any perishable product in the mind of the buyer more than any other fault. It is yearly emphasized by the comparatively high returns for fruit which carries well and opens up in good condition, despite the fact that it is known to be of poorer quality in other respects.

In conclusion, the writer realizes that the various headings under which it is suggested the value of varieties may be assessed somewhat overlap each other, but the aspects are so closely related it is difficult to entirely avoid this. It is trusted that the suggested assessment may be helpful and enable the orchardist to form a fairly satisfactory opinion on a matter which must always be subject to review.

SEASONAL NOTES.

THE FARM.

Control of Pastures in Summer.

DURING November and December the development of flowering or rank growth on pastures under grazing should be avoided as far as possible. Leafy pasture growth as a rule provides a highly suitable feed for milking-stock and for animals which are growing rapidly, whereas the stemmy or woody pasture growth that develops when flowering occurs is decidedly poor feed for such stock. The leafy growth is characterized by a markedly greater content of mineral matter, which is required for the formation of milk and bone, by a markedly greater content of protein, which is essential for the formation of milk and flesh, and by superior digestibility—about 80 per cent. of the dry matter of leafy growth is digestible, whereas only from 40 to 50 per cent. of the dry matter of stemmy growth is so. Further, pastures which are allowed to become tall and stemmy in summer assume a relatively inactive condition during a considerable and critical portion of the producing season—*i.e.*, during late summer and early autumn—whereas pastures which have not been allowed to develop to the flowering stage tend to a more prolonged and continuous production of leafy feed.

Much of the difficulty of preventing an undue development of flower heads would disappear were ensilage more extensively practised. The amount of hay it is ordinarily considered necessary to save is insufficient to absorb all the growth made in October to December in excess of the current requirements of stock. The direct result is understocking of the pastures during that period, with consequent development of rank growth unless the surplus not required for hay is utilized in ensilage.

In practice it frequently proves impossible to estimate exactly the area of grass sufficient to provide the feed required by stock. Farmers who rightly believe in good feeding usually prefer to have some feed to spare instead of being short of feed. An amount of surplus feed that may arise in this way may not be sufficient to justify its saving in the form of silage, but still be sufficient to lead to poor control of the pasture growth if it is not removed. When this is so, the most satisfactory course is to check the development of rank stemmy portions in a field by topping of the pastures—*i.e.*, running the mower over the fields to remove flower-heads. There is a tendency to delay such topping until it is far too late to obtain the maximum benefits from it.

Dry stock may often advantageously be employed to remove the topped growth, which stock consume readily when it has become partly wilted, although they neglect it before it is unmown. But even if it is impossible to provide for the consumption of the wilted topped growth it is sound practice in the interests of future production of the sward to carry out topping.

For thoroughly efficient control of the growth of pastures in summer, ensilage and topping of pastures need to be suitably associated with rotational grazing carried out in a manner which is practicable under New Zealand conditions, and which has been described previously in these notes.

Forage-crop Production.

On a great number of farms the success attained in the year 1933 will be determined to a considerable extent by the cropping work done during the next few weeks. This is because on those farms feeding of stock is a matter of basic importance, and much of the foundation of next year's

feed-supply consists of the cropping work calling for attention at the present time. Highly productive animals, such as the modern dairy cow of heavy yield and the lamb of rapid growth, require highly productive feed, which is essentially highly digestible feed. Mangels, swedes, carrots, chou moellier, rape, and leafy lucerne are all highly digestible, and hence provide highly productive feed.

The dominant source of highly productive feed in New Zealand farming is unquestionably well managed leafy grassland, but during periods of low rate of grass-growth other sources of supply have to be exploited. Herein lies the urgent need for the more extensive growing of such crops as mentioned.

Maximum Profits through Maximum Yields.—It is difficult to over-emphasize that as a rule the key to maximum profits with this class of forage crop is heavy yield. This arises from the fact that the difference between the cost of a heavy crop and that of a light one is often relatively small. To obtain any crop a considerable amount of expense has to be faced to cover such items as rent or interest on land, ploughing and other cultivation, drilling, manure, and seed. The point of importance is that a relatively small added outlay in additional cultivation or additional manure may make the difference between a good crop and only half a crop. To take a concrete instance, an additional £1 10s. per acre spent on manure and an extra £1 10s. on intertillage of the growing crop may readily make the difference between a 35-ton and a 65-ton crop of mangels. In such a case 30 tons of mangels would be obtained for a direct outlay of £3. From this it follows that portion of the heavier mangel crop is secured at the rate of 2s. a ton, which is obviously good business when it is kept in mind that mangels are worth about 10s. a ton if hay is bringing £3 a ton.

Some may be inclined to scoff at such a supposition as rather far fetched, but in so doing they are overlooking two hard facts of the position. The first of these is that it is far from uncommon to find 65-ton crops of mangels produced under conditions of soil and climate essentially similar to those under which 35-ton crops of mangels are produced. The second fact is that the difference between such crops may almost invariably be traced to the fact that the larger crops received the benefit of more thorough cultivation and of more liberal manuring. While the mangel has been mentioned in the instance just considered, it is well to remember that the position is similar in respect to other crops.

Main Factors governing Yield.—Three of the main factors giving efficiency in forage cropping are of current importance. One is the use of good seed. The saving of a few pence or even a few shillings an acre on seed for forage crops is almost invariably parsimony instead of economy. Commonly, the small saving is associated with comparatively poor germination or low vigour of seed, or with poor type or strain of plants. Poor germination or poor vigour may lead readily to a poor strike, especially if conditions are at all adverse at the time the seedlings may be expected to develop. Evidence is not lacking that complete or partial failures of forage crops are due at times to the use of seed of poor germinating capacity and vigour, and some of the poor strikes that it has been customary to attribute to unfavourable weather or attacks of pests, such as the "fly," might really have been caused by poor seed.

A second factor which favours the production of profitable heavy crops is liberal manuring to increase the fertility of the land to an extent which makes it conform to the full producing potentialities of the crop. The general position may be grasped from the fact that while the error of overmanuring of forage crops is practically unknown, that of under-manuring is widespread. It does not seem to be realized generally that in the case of even the least nutritious of the ordinary forage crops the value of a ton of the crops is more than sufficient to pay for 1 cwt. of the

fertilizer commonly used with them. This reduced to concrete form means that an increase of 2 tons an acre in a swede or chou moellier crop due to the use of 2 cwt. of fertilizer would be a profitable undertaking.

A third factor is adequate cultivation. The use of good seed and liberal manuring will prove, to some extent at least, futile unless associated with cultivation thorough enough to make the supply of air and moisture in the soil approach as near as possible to the needs of the maximum crop obtainable from the seed and manure used. At this season it seems timely to remark that the cultivation employed in the preparation of seed-beds for forage crops is often markedly below the requirements of the crop to be grown and that a poor crop could be foretold even before the sowing of the seed, and this even though liberal manuring and use of best of seed be practised.

Mangel-growing.

The mangel is particularly reliable, partly because it can withstand drought comparatively well and partly because it is not subject, as yet, in New Zealand to any serious pest or disease. When suitably treated it is characterized by very heavy yields, and this leads to the production of feed of remarkably low cost. This is to some extent indicated by the fact that a mangel crop of 60 tons an acre, which is not at all exceptional, yields as much feed as would be yielded in a year by 5 to 6 acres of pasture characterized by a carrying-capacity equivalent to one cow to 2 acres; and it is of considerable moment that this feed is available when there is marked need for it—*i.e.*, when the feed from grass is in short supply. Good treatment for the mangel is specially necessary. Preparatory cultivation should produce a fine firm seed-bed, in the absence of which poor yields may readily result even though suitable provision of seed and manure is made.

The variety Prizewinner Yellow Globe holds pride of place in point of popularity—a place which it deserves on the basis of field experience. Other varieties of known value are Red Intermediate, White Sugar, and Jersey Queen. Current standard practice is to sow about 6 lb. of seed per acre in rows 26 to 28 in. apart. As wet cold conditions tend to cause loss or stunting of seedlings, sowing should be delayed until warm soil conditions may be expected. Over wide areas November sowing is generally suitable.

As the manurial requirements of mangels are determined to a considerable extent by soil and climatic conditions it is inadvisable to prescribe any manurial dressing as the most suitable one for general use. But guidance as to what constitutes effective manuring may be gained from the fact that over wide areas good results may be expected from a dressing of 5 to 6 cwt. per acre of a mixture consisting of equal parts of superphosphate and blood and bone, or three parts of superphosphate to two parts of bone and blood. Further, it is widely accepted that such a mixture could often well be supplemented with about 3 cwt. per acre of kainit or of agricultural salt. Kainit, which contains 14 per cent. of potash as well as a considerable amount of salt, and which is not substantially dearer than agricultural salt, usually should be utilized, when it is considered that the mangel crop would benefit from potash as well as from salt.

Field Carrots.

On farms possessing areas of free-working loams the field carrot, given good cultivation, is capable of heavy yields. This is indicated by the fact that in farmers' field-crop competitions in three recent seasons 134 crops have averaged over 43 tons an acre, and have included crops which yielded in the vicinity of 70 tons an acre. Good results may be expected from a manurial dressing of 3 to 5 cwt. per acre of a mixture consisting

of two parts super and one part blood and bone. Varieties which have maintained popularity over a considerable number of years are Matchless White, Barriball, White Belgian, and Guerande. Guerande, which is a very suitable variety for sheep, is successfully grown, without thinning, in rows 21 to 26 in. apart, 1½ lb. of seed per acre being used. With other varieties good results are frequently obtained by hand thinning and cultivating carrots sown in drills 21 to 26 in. apart, but sowing in 14-in. drills also gives heavy yields. The amount of seed generally used is 1 to 1½ lb. an acre. Success generally attends sowing in November.

Lucerne.

A fine firm seed-bed is required for fully successful establishment of this important crop. Rapid and vigorous development of seedlings, which is desirable, is favoured by warmth, and because of this need of warmth the best results are generally obtained by sowing during the latter part of November or December. It is good practice to sow through every coulter of the grain-drill 12 to 18 lb. per acre of seed of Marlborough origin. Alternatively the seed may be broadcast and covered by light harrowing. Lime may as a rule be applied with advantage before the final cultivation preceding seed-sowing.

Treatment of the seed with a suitable culture is advisable, in order to ensure the presence of specific organisms upon the activity of which the ultimate success of the lucerne at times depends. Cultures are obtainable at a small cost from the Department, and prepaid orders for them should be placed about fourteen days before it is expected to sow the seed.

Ensilage.

Frequently too late harvesting of the silage crop occurs. This is a serious weakness in that it leads to (1) unduly woody silage possessing from the feeding viewpoint all the disadvantages associated with over-maturity in pasture growth; (2) less assurance of a substantial leafy aftermath which is at times of distinct value during the latter part of summer; (3) increased harm to the permanent sward due to the longer period during which shading and opening of the sward by the tall growth takes place.

Early ensilage is especially desirable in regard to the first cut of the season from a lucerne stand. This cut often contains a considerable proportion of weeds. As a rule, the longer such weeds are left unmown the more they weaken the lucerne plants. If the first cut of lucerne is harvested for silage in good time it opens the way to an extra cut annually from the lucerne field.

As a means of minimizing external wastage in stack silage, round stacks are being preferred to other shapes. In pits and trenches unnecessary wastage at times occurs because the material is not consolidated enough at the time of its collection. It may be looked upon as practically impossible to bring about overconsolidation.

—R. P. Connell, Fields Division, Palmerston North.

Precautions against Caseous Lymphadenitis in Sheep.

Now that the shearing season has again arrived it is opportune to issue a word of advice in regard to precautions to be taken at shearing to prevent the spread of the disease known as caseous lymphadenitis in sheep, which has come into prominence of late years owing to the decision of the inspecting authorities in Great Britain to examine for and reject all mutton or lamb affected with this disease.

The trouble is located more frequently in the lymphatic glands or "kernels" situated in the upper regions of the limbs, and this suggested

that the more common mode of entry of the organism is through inoculation of the wounds accidently made during shearing and crutching, castrating and docking, &c. This view has been confirmed by experimental inoculation of skin wounds at the Wallaceville Veterinary Laboratory.

It is customary where hand shearing is practised to frequently dip the blades in a reliable antiseptic, and this should always be done. It is most important that all wounds, whether caused during operations or accidentally, should be at once dressed with some antiseptic preparation. Any of the standard disinfectant solutions are suitable for use, according to directions given on the containers. If this precaution were carefully and efficiently observed in every case it would be of the greatest value in assisting towards preventing the setting-up of lymphadenitis in the sheep which have sustained the wounds, and also in helping to prevent the spread of the disease generally.

Sufficient evidence exists to warrant giving the advice that wherever the trouble is known to be present among the sheep on any farm it will be a wise and desirable precautionary measure to either saturate the soil of the yards with a strong antiseptic solution—say, one part of non-poisonous dip to twenty parts of water—or, what is better still, to dress thoroughly the surface soil with quicklime and then turn it over. In addition to the yards, there is a possibility that nearby holding-paddocks may be more or less contaminated. Where it can be conveniently done, it will be a good plan to plough up, cultivate, and resow such paddocks at intervals of a few years.

The dressing of all wounds seen at shearing-time and crutching is a very necessary precaution. This fact is brought to the notice of the Department from time to time when losses occur from blood-poisoning after shearing. Any extra labour involved is therefore worth the trouble by reducing the prevalence of lymphadenitis and also as a preventive of blood-poisoning. That ewes are more commonly affected is due to the fact that, owing to their longer life, they are more often exposed to infection of wounds liable to be caused during shearing and crutching.

Further information regarding lymphadenitis is given in the Department's Bulletin No. 140, which may be obtained free on application.

—*Live-stock Division.*

THE ORCHARD.

Spraying Operations.

Pip Fruits.—When these notes reach growers in the earlier districts the calyx spray for codlin moth will have been applied or will be in the course of application. In later districts early November should see this operation completed. Some growers, especially in Otago, have not yet realized the necessity for this spray, and often delay it until the eye of the young forming fruit is closed. In Otago the delay may be safe in some seasons, but a season occasionally occurs which upsets all calculations, with disastrous results. Moreover, seldom is it unnecessary to apply a spray at this period for other pests and diseases; indeed, it is generally necessary to apply it as soon after blossoming as possible so as to lessen the time which has elapsed since the pink spray. The addition of arsenate of lead, therefore, is a very small item, and will act as an insurance.

With the calyx spray of 1½ lb. powder arsenate of lead per 100 gallons of water for the control of codlin moth may be combined other insecticides and fungicides. If control of leaf-hopper is necessary include 1 pint of nicotine sulphate. Bordeaux mixture, 3–4–50 (3½–2–50 if hydrated lime is used), or lime-sulphur, 1 in 120 to 170 according to the strength (sulphide

sulphur content) of the material purchased, will be necessary if black-spot is troublesome; of the two, lime-sulphur is preferable on varieties subject to russet, or if either powdery mildew or red mite is a factor.

Later sprays will probably consist of applications of arsenate of lead, 1½ lb. per 100 gallons water, lime-sulphur, 1 in 120 to 170, and a finely divided sulphur, 2 to 5 lb. per 100 gallons, according to the article used. It will be necessary to make these applications at intervals of ten days to three weeks according to locality and necessity. By including spreader at the rate of ½ lb. to ¾ lb. per 100 gallons in each application efficiency is greatly increased. The addition of 4 lb. to 6 lb. of hydrated lime to the 100 gallons of wash will considerably reduce any liability to burning of the foliage.

In the event of red-mite infection becoming serious the addition of ¾ gallon of winter oil to 100 gallons of the mixture will prove very effective. The use of "summer" or so-called "white" oils, although effective against red mite, must be restricted to applications at such times when there is no residue of sulphur or lime-sulphur on the trees, and neither of the latter should be applied for some weeks after the trees have received an application of a summer oil.

Stone Fruits.—For the control of brown-rot and other fungi lime-sulphur, 1 in 120 to 170 (according to strength), will probably have been applied at petal-fall. Another application is advisable as soon as the calyces have fallen from the young forming fruit. When peach-green aphis first makes its appearance add nicotine sulphate, 1 in 800, to the lime-sulphur. As nicotine sulphate is in itself inert, it requires such substances as arsenate of lead, bordeaux, lime-sulphur, or soap to liberate the nicotine which is the actual killing agent; therefore, if it is to be used alone, add 2 to 4 lb. of soap per 100 gallons of wash. The effectiveness of nicotine lies in its volatility, and as it becomes more volatile with increasing heat more effective work is done with this spray in hot weather.

Leech on Cherries, Plums, and Young Pear-trees.—With the first appearance of leech eggs on the leaves an application of arsenate of lead, 1½ lb., and spreader, ½ to ¾ lb., per 100 gallons of water should be made. At this time the fruit is not far advanced, and is not likely to have its appearance spoiled by the spray, especially if a spreader is used. This spray gives a good coating to the earlier developed leaves, which will remain for a considerable time. Through the maturing and picking season a spray on a still day directed not at the tree but upwards in the air above it, so that it will fall like a mist on the tree, will afford additional protection to the older leaves, also some will fall on many of the young leaves, while very little will be deposited on the fruit. The leech grub does not remain on one portion of the leaf or even on the one leaf, but travels to a number, and is liable to be poisoned before it has moved very far. Much injury has been done to cherry-trees by neglecting the control of leech during the season when the fruit is on the trees, and considerable protection of the foliage has been achieved with a very light mist in the manner described without disfigurement to the fruit.

Cultivation.

Where the soil has been worked down to a good tilth harrowing, with an occasional heavier working with cultivator and disks, especially after heavy rain or irrigation, will be the main operation in this branch of operation. Where difficulty has been experienced earlier in the spring in obtaining efficient pulverization of the soil, the opportunity should be taken when clods have been softened by rain. Every effort should be made to conserve the moisture in the soil by regular and intelligent working with the most suitable implement at the time, so that the top soil is friable, devoid

of lumps, and has an even surface but without a crust, so that the smallest surface possible is exposed to drying winds, and yet leaving it in such a condition that the air can percolate through. Such a condition of soil will materially assist the action of the bacteria in changing the unavailable plant-food already in the soil and that supplied by manures into a form in which the trees can absorb it, thus assisting growth, increasing the leaf-surface, and, in consequence, improving the quality of the crop generally.

Grafts and Buds.

Trees that have been worked over either by budding last autumn or grafting this spring, must receive constant attention. Almost daily visits are necessary for a while to see that no openings have been caused by the growth of the scion. Many a graft has been saved from an early death by pushing over the cracks a little of the surplus wax which is almost always to be found around the working, thus excluding the air from the union. Where there have been misses, healthy shoots should be encouraged to grow from the stock by protecting them from overgrowth of undesirable shoots; the former can then be budded in the autumn to fill up the gaps with very little loss of time. Remove as few as possible of the shoots coming from the stock, but control them by shortening back; they will assist very materially in keeping vigour in a tree that has already been so severely dealt with by heading back for reworking.

Thinning the Fruit.

The thinning of all stone and pip fruit, especially peaches, nectarines, apricots, and apples, is now recognized as essential to the proper maturing of a good-quality crop. In Central Otago it is a regular orchard practice with practically all stone and pip fruits, its neglect being looked upon just as severely as the omission of pruning or spraying. Much will depend on the vigour of the tree and the surrounding circumstances as to the extent of thinning necessary, but it is good practice to thin heavily on poorly growing trees leaving more fruit to mature on the more vigorous ones. In these times only high-quality fruit is likely to command good prices, especially in the case of stone fruit. Eliminate, therefore, poor and marked fruits, and any surplus above which it is considered the tree can mature to a good size and grade. To get the best results thinning should be done early—that is, as soon as the early drop is over. In districts where late spring frosts occur it may be well to thin twice, merely singling the fruits as early as possible at the first thinning, and giving a final one when danger from frost is over.

—W. R. L. Williams, Orchard Instructor, Alexandra.

Citrus Culture.

Collar-rot is in evidence in quite a number of citrus orchards, and this disease becomes very troublesome unless it receives attention from the grower. The first indication that the tree is attacked by collar-rot is often the presence of an exudation of gum from the trunk. If the area of gumming is examined the bark in the vicinity will be found at first usually discoloured and moist, later becoming dry and brittle. Infection generally commences near the soil-level and works upward. The disease develops slowly, but will eventually ringbark the tree if left unchecked. Young trees develop a yellowing of the leaves and a general thin appearance of the foliage, but the upper portions of older trees do not show this weakness until the disease has made considerable headway.

Possibly one of the main causes of collar-rot is faulty drainage, while trees planted too deeply will also be susceptible to the disease. Treatment consists of the removal of all the diseased bark, together with a

small portion of the healthy bark all round the edges. The wounds should then be painted over with bordeaux paste. Stockholm tar has given good results in some cases and does not cause any injury to the exposed healthy tissue, with the result that new bark is formed almost at once over the wound surface.

General routine work should be continued, as the neglect of even a minor operation may cause undue loss to the grower. Cultivation should be given at regular intervals during the next few months in order to maintain the trees in a good growing condition. Spraying for the control of the various pests and diseases should also be kept in view from time to time, and each spray applied in its proper season.

Budding may be done during October or deferred until the autumn. If the work is done in the spring the shoots may be headed back to a bud at about New Year, when good wood-growth will develop during the autumn.

—L. Paynter, Orchard Instructor, Auckland.

POULTRY-KEEPING.

Late-hatched Chicks.

It is only in exceptional cases, and where specially favourable conditions are present, that it will pay to hatch November chicks. If, therefore, more chicks are required there should now be no further delay in securing them, for the later the hatching the lower will be the productive capacity of the flock. Too often the late-hatched birds are turned into stale quarters and runs, and also have not the protection from hot weather which nature demands, with the result that they fail to make satisfactory development as compared with chickens hatched earlier in the season.

The drawbacks of late hatching can be counteracted to a great extent by placing the chickens in a clean fresh run which has the advantage of being well shaded. Their quarters should be scrupulously clean, as a preventive against parasitic infestation making its appearance and the young birds receiving a set-back as a consequence. At all costs guard against overcrowding, remembering that the smaller the number of chickens in a flock the better will they thrive. Do not attempt to rear weaklings or deformed stock, as these should never be bothered with. Better far to destroy them at the outset and save the worry of trying to rear birds which, even if they come to maturity, may never pay for their keep. Again, it is the weakling which usually catches every passing ailment, and may thus be the means of introducing serious trouble into the flock.

The late-hatched chickens must be supplied with ample good palatable food. If birds of any age are to thrive and do well plenty of good nourishing food is necessary, and this applies especially where late-hatched pullets are concerned. With the advent of summer conditions, growing birds are apt to leave their food, especially on very hot days, and consequently are likely to receive a set-back from which they never recover. The fact of the birds not appreciating their food does not necessarily mean that they are being overfed, and more often it indicates that they are tired of the one class of food that is being provided. When this occurs it is advisable to change the ration and make it as appetizing as possible. Where milk is available, the mash mixture should be moistened with this. It not only makes the food more appetizing but also tends to promote good health and sound development in the growing bird. In addition, milk has great value as a drink. If there is any doubt as to the merits of milk for chickens the poultry-keeper should conduct a test, giving one lot of chickens milk and another hot water, and watch results. It may be contended that milk adheres to the feathers of the birds, giving them

an unsightly appearance. Admittedly this applies where the milk is provided in an open receptacle, but not so where proper drinking vessels, specially made for the purpose, are used. It goes without saying that the drinking vessels should be frequently washed in hot water and maintained in a clean, sanitary state.

Then again, if the chickens are to make sound development succulent green material cannot be oversupplied. Indeed, when hot weather conditions prevail they will half live upon green food, if given the opportunity. Where watercress is available this will prove an excellent food for growing stock or, indeed, for birds of all ages. This valuable food grows in close reach of many poultry-keepers who never use it, simply because they do not realize its value. Probably there is no better green food grown than watercress for toning up the system and generally promoting good health in all classes of poultry stock.

Separating the Male Birds.

On all plants where hatching operations have terminated for the season male birds should be separated from the hens, which will lay as well, if not better, without the males. It is seldom that a male bird can be depended upon for breeding purposes after the third season, and the keeping of such stock means a continual drain on profits. The aim of the poultry-keeper should be to avoid having on the plant a bird which has passed its best period of usefulness. Hence it will pay to dispose of all old cocks at once. Even young males which are showing signs of an impaired constitution, and which do not promise to be serviceable for future breeding purposes, should also be got rid of. It should be remembered that strong constitutional vigour is the basis of disease resistance and heavy producing stock, and that no bird should be retained on the plant for breeding purposes which is lacking in this respect.

Disposing of Surplus Cockerels.

There should be no delay in marketing all surplus cockerels that have reached the age of about five months. If these are got rid of it will not only mean better conditions for the remaining stock, but will also save labour and money. It should be borne in mind that once a bird passes the chicken stage it costs more to feed and grows less in value every day. Cockerels which have been well fed and managed up to, say, five months' old will be found with good frames and in a good table condition, but when kept longer they commence making feathers and bone, and are not then in a fair condition again until they reach a mature stage. Even if a fully developed cockerel is marketed in absolutely prime condition, it is not favoured by the high-class poulterer, to whom it is known as a stag. The fact of its having a well-grown spur sharp at the point condemns it as a desirable roasting fowl, and its value is reduced accordingly. Such a bird is coarse and larger than is generally desired for the high-class trade. It is the flesh of the prime four to five months' old bird that is most sought after and which commands the highest price.

Cockerels intended for market should be separated from the pullets as soon as the sex can be determined. It is practically impossible to prime cockerels when on range and having the company of females. When the priming process begins, at about three and a half months, exercise must be curtailed, as too much of this does not tend towards rapid flesh formation.

The poultry-keeper should not try to prime cockerels on inferior or damaged food. If a maximum amount of flesh is to be produced in a minimum of time the food should be sound and fed with a free hand. Only soft food should be given. A suitable mash may be made from two parts of bran and one part each of finely-ground wheat-meal and maize-meal, with 5 per cent. by weight of meat-meal added, the whole being moistened

with hot water or skim milk, and mixed into a crumbly mass. Feed three times a day as much as the birds will eat up clean. Succulent green food can be fed in abundance, but separately, and where skim-milk is available it may be given in large quantities to drink, while grit should be in reach of the birds at all times to pick at. Above all, see that the birds themselves, as well as the quarters, are free from vermin, for however good the food may be, the birds will fail to put on the desired weight if insect pests are present.

In view of the high prices which the consuming public are being asked to pay for prime table chickens, as compared with the ruling rate for fresh eggs, there should be every inducement to the producer to feed and manage his surplus cockerels in such a way that they will command the highest ruling prices. Especially should this apply during the forthcoming festive season.

Hens losing Feathers from Back.

A correspondent is very concerned regarding some of his fowls losing feathers from their backs, and asks if this is due to feather-pulling. This condition is found only when the hens are running with male birds. It need not cause any anxiety, as the bare places will soon feather over when the male birds are removed from the pen. It is always the best layers which become affected in this way, and particularly where the birds are overmated on the male side or the males are very vigorous.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

Swarming and how to deal with it.

UNTIL a beekeeper has passed through his first season it is well to depend upon natural swarming for any increase required. After a season's experience a more reliable method may be adopted for enlarging his operations. If increase by natural swarming is followed it is well to effect delay so far as the first swarms of the season are concerned. Very early swarms are not advisable, as the weather and flow of nectar are not always to be relied upon. Usually the swarms are smaller than when delayed, and may have to be fed should the weather prove unfavourable after they have been hived. On the other hand, when swarming has been delayed for two to three weeks the weather and flow of nectar are certain to be much more favourable. In any case the swarms will be larger, and the work of the parent hive and the swarm will go on rapidly and without interruption.

One of the chief factors in delaying swarming is to enlarge the hive. By giving the colony a super more working room is provided, the nurse-bees are kept busy, and the queen has additional combs in which to lay. Of course, there is a right and wrong time for doing this. The best time to add additional supers is when the brood-chamber is getting fairly full of bees, the weather mild, with a fair flow of nectar, and before queen-cells are started. If the supers are placed on the hives before there is a good force of bees and plenty of emerging brood, there is a danger of the extra space causing a check on brood-rearing, as the additional space will affect the temperature of the hive. However, if the supers are not put on before queen-cells are started it will be too late to have the desired effect, and the preparations for swarming will proceed.

When putting on the supers, if the weather is mild, a frame containing a little sealed brood should be transferred from the brood-chamber to the centre of the upper box, and also two of the side frames of comb, all with adhering bees, placing the latter combs one on each side of that containing brood, and filling their places below with drawn-out combs or frames of foundation.

The presence of several queen-cells in a hive points almost invariably to the fact that swarming is about to take place. When a number of queen-cells are sealed the swarm emerges headed by the old queen, accompanied by the majority of the field-bees. The swarm will seek an alighting-place, usually some distance from the hive, and cluster there like a huge bunch of grapes, while skirmishers from the cluster will go further afield seeking a permanent home. However, the beekeeper usually intervenes and provides the permanent home before the swarm has decided on one. The swarm is gathered into a box, which is placed in the shade, and towards sunset is transferred to a clean hive in its permanent position. Next day work starts with vigour, and, given favourable weather, within a week honey and pollen and worker-eggs will be appearing in the combs. The presence of worker-eggs is an indication that the colony is queen-right.

In the parent hive the young queen will be developing, and the first one to hatch will, unless prevented by the workers, crawl over the combs and endeavour to tear down any other queen-cells she may find and to sting to death their occupants. If foiled in this she will probably lead another swarm from the hive. This may occur three or four times in one hive, leaving the parent stock badly reduced in numbers and the beekeeper with several small swarms which will be useless to provide a surplus. The remedy for this state of affairs is for the beekeeper to examine the hive immediately after the first swarm has emerged, and himself destroy or remove all the queen-cells but one or two.

Unless there is a good honey-flow, or if bad weather sets in, the swarms should be fed inside the hive. This is to give them a good start, and to provide them with material for producing wax. Excellent combs can be produced from sugar syrup. Only the best white cane-sugar should be fed. It is advisable in all cases to hive the swarm on full sheets of foundation, and thus take advantage of the natural instinct of the bees to produce wax after swarming. Very little time will be gained if the bees are put on to drawn-out combs.

Frequent examinations of the colonies—every week or ten days during the swarming season—for the purpose of cutting out queen-cells will help to check swarming, but this requires considerable work, and, since it frequently fails in spite of every care, is not usually relied on.

The occurrence of swarming is largely due to overcrowded brood-chambers. This condition of affairs irritates the nurse-bees, which start rearing queen-cells; therefore the queen should be given plenty of room to lay. A suitable plan is to remove all the frames of brood, except the two centre combs, from the bottom chamber. Empty combs or frames fitted with sheets of foundation are put in their place. Secure the queen, and confine her in the new brood-chamber below a queen-excluder, placing the old brood-nest directly above, thus giving additional work for the nurse-bees and plenty of room for the queen to lay in. In six to eight days examine the top frames, and remove any queen-cells that may have been built. If for some reason this plan is not desirable, swarming may be controlled and the strength of the colonies equalized by transferring part of the brood from the strong to the weaker ones. Empty worker combs or frames fitted with sheets of foundation are used to replace the transferred brood-combs.

The age of the queen is another factor in promoting swarming. Just as the poultryman relies on his pullets for greater egg-production, so the beekeeper should rely on young queens, and the sooner he realizes this the less trouble he will have in keeping swarming down to a minimum. It is the exception for the queen of the current season's rearing to swarm. Ventilation also plays an important part in controlling the natural inclination to swarm, and care should be taken to provide sufficient at all times of

the season. No single system will be found universally effective. Climatic conditions frequently play an important part in bee behaviour. It will be found, however, that the methods stated, or a variation of the same employed either singly or in combination, will materially assist in the prevention of swarming.

—*E. A. Earp, Senior Apiary Instructor, Wellington.*

HORTICULTURE.

Vegetable Crops.

ATTENTION to seedling crops is most important at the present time. Heavy rain compacts the surface and frequently forms a hard crust that facilitates evaporation and is disastrous to young seedlings unless it is broken up to conserve moisture and aerate the soil. In land that has become foul with seeds of weeds, prompt attention is also necessary on fine days to hoe the crops lightly and destroy the young seedling weeds so soon as they appear. To wait until they are obvious is not satisfactory; the work should be done as soon as they are seen by close examination. If the crops have been sown thinly, as advised, thinning the seedlings will be comparatively light work; but it should be done promptly in dull weather as soon as the plants are of a sufficient size to be conveniently handled. This work is of the greatest importance, and failures are commonly due to its neglect.

In dry localities where good summer cabbage cannot be grown satisfactorily excellent substitutes are silver-beet (Swiss chard) and New Zealand spinach. These flourish under such conditions and by many people are preferred. Plants of New Zealand spinach should be set out 3 ft. apart, or seeds may be sown and thinned to the distance named. Sow also quick-maturing turnips in a cool place, and lettuce thinly to mature where sown. November is usually the time selected for sowing Swedish turnips, but in warm localities it is often best deferred for a few weeks.

As small fruits and many kinds of vegetables are available towards the end of November, it is advisable to stop cutting asparagus and pulling rhubarb. If a good dressing of manure is applied then the plantations will soon make the strong growth upon which future crops depend.

Small Fruits.

The harvest of small fruits will soon commence, gooseberries and strawberries being the first to mature. Fruit-picking is usually considered pleasant and easy work, requiring little experience, but this is far from the truth; it demands steady concentration and consistent judgment from the picker, or serious loss of crop is incurred and the reputation of the garden is ruined. Strawberries must not be picked while there is moisture on the plants. In cool weather and for nearby markets they should be picked riper than for shipping long distances. For heavy cropping they must be picked clean at short intervals. They should be picked with a stem $\frac{1}{4}$ in. long, the small and misshapen berries for culinary use being placed in a separate receptacle. The berries should be placed in the punnet in a compact manner and the punnet well filled; they will not then shake down in transit and cause damage and disappointment. As the packed punnets are placed aside by the pickers they should not be allowed to remain in the sun, but be gathered promptly and taken to a cool place and packed in clean crates. No fruit is so popular with the public as clean strawberries consistently packed. If the delivery is well spread and judiciously advertised, it should be profitable. In the past two things have often spoiled much of the trade in this perishable fruit; they are high prices and unsatisfactory packing.

Strawberry plants for stock should not be allowed to fruit; by removing the blossom, runners are formed more quickly, and if the numbers to each plant are limited they will be vigorous and ready for early planting in the autumn.

On a light rich soil in warm localities the Cape gooseberry (*Physalis peruviana*) carries very good crops that are usually in demand at profitable prices. They should be planted out now in land that is well prepared; 3 ft. between the plants and 6 ft. between the rows are suitable distances. They will crop for two or three seasons before replanting is necessary on fresh land.

A fruit which might well be grown to a greater extent is the tree tomato (*Cyphomandra betacea*). It requires good land and a well sheltered position, and is suitable only for planting in the warmer districts. The fruit is said to be particularly delicious when cooked. It is a perennial, growing to a height of 6 to 8 ft., and may be planted now about 3 ft. or 4 ft. apart. At present a limited supply of fruit is available during the winter months. It is quite a good keeper and carries well.

That indispensable ingredient in the fruit salad—the passion-fruit (*Passiflora edulis*)—may be sown now in boxes, and pricked out in boxes later about 4 in. apart, and grown on for planting out in October next year; or the seed may be sown now where the plants are to grow permanently. Sow a few seeds at intervals of 9 ft. or 10 ft., with about the same distance between the rows. Further particulars were given in the August number of the *Journal*. The passion-fruit requires a light rich soil for consistent heavy cropping, also good drainage and shelter.

Tomato Crops.

In the unheated glasshouse the first picking of ripe fruit is usually made towards the end of November. It is customary to trim off the lower leaves from around the bottom bunch to expose it to the sunlight to ripen; it also has the effect of assisting in the circulation of the air and in ventilation which now usually becomes difficult owing to the dense foliage and the large amount of moisture given off. The tomato plant demands a comparatively dry atmosphere and moderate temperatures. If these are not maintained the foliage soon becomes soft, thin, and abnormal, and very subject to the leaf-mould fungus *Cladosporium fulvum*. This disease is fully described in last month's *Journal* in an article from the Plant Research Station at Palmerston North, which should be carefully studied. Leaf-mould causes great loss annually in the tomato crop under glass, and it is preventable if the right treatment is given.

Leaves trimmed off should be carried out and burnt. Where the subsoil is of a shingly open character, and considerable watering is necessary, it is advisable to mulch the plants by spreading a light dressing of strawy stable manure over the surface of the ground. By doing this water is conserved and the plants fed at a time when it will be most beneficial. In the absence of stable manure clean straw may be used. An occasional application of liquid manure will now be beneficial, but it must be remembered that great harm may be caused by overdoing it. In this solution sulphate of potash should be included, as it will do much to counteract the tendency to abnormality of the crop under glass.

Where the tomato crop is to be grown outside planting-out will now have to be considered. Good preparation of the land is the first essential. Especially where the land is light should a green cover-crop be ploughed under, followed by a dressing of phosphate and potash worked in with the cultivator or harrows. This is frequently composed of 2 oz. superphosphate per square yard (5 cwt. per acre) and 1 oz. sulphate of potash, together with a liberal allowance of bone-meal, but where the land is rich in nitrogen the potash should be increased. If it is desired to drill in

manure down the planting rows it should be well mixed in and done two weeks or so before planting. In no instance should manure be placed in the hole made for setting the plant.

It should be obvious that a good crop cannot be grown from poor plants, but it is not uncommon to find the attempt being made. Unless the plants are clean, sturdy, and well hardened off, it is better not to plant them. They should be well watered the day before planting, and when taken out on to the ground the individual plants should be carefully lifted with as much soil as possible and set deep and firmly in the ground; 12 to 15 in. apart and 3 ft. between the rows is average spacing, and at these distances it will take about 12,000 plants to the acre.

In sheltered localities stakes are sometimes set for supporting the plants; but more often a wire trellis is used. Light cultivation should be given every week or so after planting; it greatly encourages growth and prevents the establishment of weeds; deep cultivation is often injurious, especially after the plants are established.

The stem-boring caterpillar, which did so much damage two seasons ago, was prevented from attacking the plants last season by timely applications of arsenate of lead. That experience must not be forgotten, or the misfortune will undoubtedly recur.

The Homestead Garden.

In order to master the science and art of the garden it is necessary to carefully harvest the experience of each season as it passes and retain what is valuable by giving it careful consideration, sometimes even recording it in the garden note-book. In one's own garden, and others visited, impressive results are often seen that are of the greatest value to those who desire to excel. Very much admired during the past month or two was a large group of the star-flower (*Triteleia uniflora*), a visitor from Buenos Aires. Growing on a dry bank supported by rocks, and associated with mats of aubretia, the white starry flowers trembling on invisible stems about 6 in. high never failed to appeal. It is not the least trouble, the position suits the plant, and it is vigorous without solicitous attention. The long succession of daffodils, commencing with paper-white polyanthus in midwinter, to the poeticus or pheasant's eye in October, are equally at home in the foreground of a shrubbery where they have grown for years without being lifted. They spring up in their season in lusty sheaves of blossom of surprising quality. A little further back in the border lilies of many kinds, nerines (Guernsey lily), vallotas (Scarborough lily), belladonnas (*Amaryllis belladona*), montbretia, agapanthus, and watsonia, flourish amazingly with little attention and make a gorgeous procession. They are certainly not improved by fussy attention, and enjoy their peaceful environment.

Herbaceous plants that are annual, biennial, and even perennial, being more ephemeral, have to be renewed from time to time, and so require special quarters. Wallflowers and other biennials are sown now for flowering next season. Primroses and polyanthus, when flowering is done, should be lifted, divided, and planted in a cool, shaded place until autumn. Herbaceous perennials should be severely thinned and staked in good time. If they are fed when in full growth the blossom will be improved.

Suckers should be removed from roses; also the new wood should be thinned by pruning where it is crowded, especially about the centre of the bushes. Sucker growth from rambler roses should be thinned, leaving only a few of the strongest canes, which should be tied in so soon as they are sufficiently hardened. Wall plants should be mulched and watered, especially if they are young and the weather is at all dry.

—W. C. Hyde, Horticulturist, Wellington.

WEATHER RECORDS: SEPTEMBER, 1932.

Dominion Meteorological Office.

DURING each of the past five months rainfall has been below normal for the greater part of the Dominion, and the last three months have been exceptionally dry. Taken as a whole, indeed, the period has probably been the driest, for the time of year, experienced during the past sixty or seventy years. Nevertheless, as regards September, in eastern districts of the North Island, from Hawke's Bay to East Cape and in parts of the Coromandel Peninsula, more than the normal rainfall was received, Hawke's Bay particularly having a very wet month.

As regards temperature and sunshine, the prevailing easterly winds exercised a marked controlling influence on the conditions experienced. On the east coast, especially of the North Island, sunshine was very much below average. The persistent dull weather resulted in temperatures, also, being much below normal, although after the 3rd there was no really very cold weather. But the farther westwards one goes, the greater is the improvement noted, until on the west coast, as, for instance, at New Plymouth and Hokitika, and in parts of the interior, both temperature and sunshine prove to have been above the average for September.

Pressure Systems.—There was an extraordinary persistence of high pressure around New Zealand during September, but especially in about latitude 45° S. On the 1st and 2nd a fairly deep double westerly depression passed, both primary and secondary bringing pressures in the neighbourhood of 29·4 in. to the southern extremity of the Dominion. Thereafter, barometers practically never fell below 29·8 in. in the Foveaux Strait area. It was in connection with the depression of the 1st and 2nd that the only typical, strong north-westerly winds occurred, while the southerly winds following it on the 3rd brought the last touch of real winter weather, snow falling on the high levels and hail on parts of the east coast.

Another series of westerly depressions passed between the 5th and the 8th, but they were shallow and the winds accompanying them were not strong. Nevertheless, they brought the heaviest rains experienced during the month to the west coast of the South Island.

On the 9th a very intense anticyclone advanced across the South Tasman Sea. The centre, as it passed on the 10th, was just to the south of New Zealand, and barometers at several places read over 30·7 in. At this time of year one expects the anticyclones to pass well to the north. The consequence of this departure from normal conditions was that the prevailing pressure gradient was reversed, there being a fall towards the north instead of a rise. In place of the usual westerlies or north-westerlies, winds between south and east were experienced. These conditions prevailed with only few and short breaks until the end of the month. There is no record of a similar spell of weather in past years. During the period a number of cyclones formed off the central east coast of Australia. There was much stormy weather on the New South Wales coast, and vessels crossing the Tasman Sea reported strong easterly winds of unprecedented persistence. By the time the cyclones reached New Zealand most of their energy was expended. The principal ones passed on the nights of the 15th and 19th respectively and on the afternoon of the 27th. The last mentioned was the deepest and its centre crossed the Auckland Peninsula, while the others followed more northerly tracks. Each of them caused widespread rain. That of the 15th was responsible for the only really good rain experienced in the eastern portion of the South Island, Canterbury, particularly, having moderate to heavy rains. In connection with the last one, heavy thunderstorms occurred in parts of the Auckland Peninsula. This depression caused very persistent and, in places, heavy rain in Hawke's Bay.

Apple-grading Machines.—Mr. M. Davey, Orchard Instructor, Mapua, writes: "Machines of the rope grader type can be improved by replacing the ropes with high tension rubber hose. This alteration obviates two weaknesses in rope graders—namely, contraction and expansion of the ropes under the influences of dry and moist atmospheres, and the difficulty of cleansing the ropes, the hose being readily washed with soap and water."

RAINFALLS FOR SEPTEMBER, 1932, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	3·16	15	1·02	5·02
Russel	2·93	11	0·60	3·96
Whangarei	4·41	15	1·14	4·87
Auckland	2·39	15	0·54	3·71
Hamilton	1·38	13	0·37	4·41
Rotorua	2·15	9	0·42	5·13
Kawhia	1·82	9	0·36	4·67
New Plymouth	1·98	14	0·57	5·06
Riversdale, Inglewood	3·51	12	0·73	9·69
Whangamomona	1·20	6	0·43	7·32
Eltham	..	..	..	4·58
Tairua	7·06	13	2·54	4·81
Tauranga	2·93	11	1·02	4·39
Maraehako Station, Opotiki ..	2·30	13	0·80	4·31
Gisborne	3·66	10	0·98	2·98
Taupo	1·40	11	0·42	3·89
Napier	3·70	15	0·92	2·22
Hastings	4·34	14	2·50	2·55
Taihape	1·10	9	0·31	3·23
Masterton	1·41	15	0·26	3·06
Patea	1·42	10	0·38	3·68
Wanganui	1·04	6	0·45	2·91
Foxton	0·61	7	0·14	2·49
Wellington	1·05	15	0·16	3·11
South Island.				
Westport	5·00	13	2·08	8·30
Greymouth	6·18	12	1·55	8·18
Hokitika	6·61	13	2·05	9·21
Ross	5·11	8	1·79	12·77
Arthur's Pass	5·33	8	2·30	14·97
Okuru	4·20	5	1·80	12·21
Collingwood	3·57	7	1·99	9·67
Nelson	1·16	6	0·79	3·69
Spring Creek	0·60	6	0·26	2·67
Hanmer Springs	2·67	9	0·69	4·65
Highfield, Waiau	1·22	5	0·68	3·03
Gore Bay	1·42	10	0·39	3·02
Christchurch	1·04	12	0·29	1·74
Timaru	0·95	4	0·73	1·94
Lambrook Station, Fairlie ..	1·49	7	0·63	2·20
Benmore Station, Clearburn ..	1·43	7	0·67	1·95
Oamaru	1·17	9	0·66	1·66
Queenstown	1·44	4	0·70	2·57
Clyde	0·96	7	0·52	1·05
Dunedin	1·18	9	0·64	2·75
Wendon	1·58	8	0·50	2·47
Gore	..	..	..	2·84
Invercargill	1·02	11	0·34	3·27
Puysegur Point	3·25	11	1·09	6·54
Half-moon Bay	1·29	12	0·26	5·24

Supply of Lucerne Cultures.—All orders for lucerne cultures prepared by the Department of Agriculture for inoculation purposes should be addressed to the Director, Fields Division, P.O. Box 442, Palmerston North. Charges are as follows: 2 oz. bottle, 2s.; 3 oz., 4s.; 4 oz., 6s.; 6 oz., 8s.

NUMBER AND CLASSIFICATION OF SHEEP IN NEW ZEALAND AS AT 30th APRIL.

TABLE I.—SUMMARY BY SHEEP DISTRICTS, 1932.

Class.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago (including Southland).	Total in Dominion.
Stud rams (entered in flock-book)	1,790	1,228	4,149	822	4,617	4,563	17,169
Other rams	49,484	102,176	93,942	19,322	87,344	99,604	451,882
Wethers	339,728	491,500	498,886	242,993	474,220	683,499	2,730,826
Breeding-ewes	1,807,831	3,835,873	3,527,292	778,036	3,396,623	3,717,405	17,063,060
Dry ewes	126,881	254,261	200,310	76,891	302,756	307,079	1,268,178
Lambs	666,640	1,595,890	1,349,126	330,829	1,373,154	1,845,034	7,160,673
Totals, 1932 ..	2,992,354	6,280,928	5,673,705	1,448,903	5,638,714	6,657,184	28,691,788
Totals, 1931 ..	3,311,406	6,424,856	6,150,614	1,496,927	5,707,731	6,700,982	29,792,516

TABLE II.—COMPARATIVE STATEMENT: TEN YEARS, 1923–32.

Year.	Stud and Flock Rams.	Stud Breeding-ewes.	Stud Dry Ewes.	Stud Lambs.	Total Stud Sheep and Flock Rams.	Sheep of Distinctive Breed not entered in Flock-books, and Crossbred Sheep.				Grand Total, Stud and other Sheep.
						Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	
1923	330,055	172,843	9,013	119,749	631,660	2,551,627	12,890,160	808,919	6,199,073	23,081,439
1924	332,814	179,533	9,727	132,137	654,211	2,807,832	12,896,561	1,036,723	6,381,249	23,775,776
1925	355,579	184,744	7,867	131,485	679,675	3,063,663	13,530,479	875,899	6,398,239	24,547,955
1926	370,535	192,055	10,053	138,526	711,169	3,212,435	13,756,197	1,069,682	6,155,510	24,904,993
1927	388,274	199,219	8,644	144,897	741,034	3,074,974	14,632,511	823,047	6,377,450	25,649,016
1928	396,351	205,720	7,347	145,969	755,387	3,024,647	15,328,331	861,780	7,163,653	27,133,810
1929	422,331	219,802	7,203	156,526	805,862	3,289,135	16,388,353	875,495	7,692,537	29,051,382
1930	448,617	244,480	7,884	174,862	875,843	3,367,916	17,319,695	1,069,788	8,208,045	30,841,287
1931	461,998	238,281	8,081	169,879	878,239	3,429,552	17,370,448	1,202,633	6,911,644	29,792,516
1932	469,051	232,006	7,855	164,750	873,662	2,730,826	16,831,054	1,260,323	6,995,923	28,691,788

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

ARTHRITIS IN LAMBS.

D. S., Hinds :—

Can you advise me how to deal with what I take to be arthritis in lambs? A number of lambs in the mob are affected, of ages from one to three weeks. The lambs appear well otherwise, but are so cramped in the legs as hardly to be able to walk at all. They are on a big clean paddock which was spelled all winter, and rock salt is provided. The lambs are Corriedales.

The Live-stock Division :—

Arthritis in lambs is due to a specific organism which has a special propensity for settling in the joints of the new-born animal, where it sets up an inflammation with a certain amount of pus formation in the joint. The infection may gain entrance at birth through the unhealed umbilicus (navel) at the time of or immediately after birth, or more often through wounds following tailing or castrating. There is no specific cure for this disease, but experience has shown that gentle exercise, especially late in the evening and early in the morning, somewhat allays the mortality, chiefly due to the fact that the lamb on being disturbed is able to obtain the necessary nourishment from the ewe which it would not obtain when lying down. As a means of prevention, all carcasses of animals dying from any disease should be either burned or buried deeply in lime to prevent contamination of the soil and pastures. Ewes about to lamb should be placed on fresh clean pastures. Lambs should be marked and tailed in temporary yards erected in clean paddocks as free as possible from contamination from any animal affected with disease. All instruments used at marking should be sterilized by boiling, and clean boiled water and reliable antiseptics should be freely used during the operations. The tailings, &c., should not be left to be spread over the pastures, but should be either burned or buried.

COMMERCIAL GROWING OF ALMONDS.

S. A. EDWARD, Whangarei Heads :—

I would like to know of the commercial possibilities of almond trees—whether they flourish in a seaside situation on second-class land, whether they crop sufficiently well enough to pay, and whether any particular root or stock is necessary; and, if so, if obtainable in New Zealand.

The Horticulture Division :—

Almonds are grown only to a small extent in this country at present, chiefly in Hawke's Bay and Otago for home use. Experience demonstrates that good crops of excellent quality can be grown in those areas, but to compete commercially with the low cost in Europe and cheap transport, economical methods of production and marketing would have to be evolved here. For this reason it is advisable to prove your locality with a well-chosen variety test before attempting commercial planting. Almonds require a good light soil that is well drained and a position not subject to heavy spring frosts. A seaside situation and second-class land such as you describe does not sound promising for commercial production. Good trees may be obtained from nurserymen in the Dominion.

Noxious Weeds Orders.—The Patangata County Council has declared milk or variegated thistle to be a noxious weed within that county. The Pohangina County has similarly declared gorse within its territory.

KILLINGS AT MEAT-EXPORT WORKS.

THE following table, compiled from Meat Producers Board statistics, gives particulars of aggregate killings and/or equivalent output at meat-export works in New Zealand for the past five years ended 30th September :—

Year ended 30th September.	Beef Quarters.	Mutton Carcasses.	Lamb Carcasses.	Pork Carcasses.	Boned Beef =Freight Carcasses.	Sundries =Freight Carcasses.	Total Equivalent in 60 lb. Freight Carcasses.
1927–28	394,821	2,005,333	5,947,197	147,601	283,749	125,200	6,998,086
1928–29	151,115	1,751,979	5,971,557	159,297	161,597	153,331	6,152,695
1929–30	177,379	2,621,275	6,925,859	133,591	194,311	229,673	7,506,227
1930–31	143,169	2,132,532	7,783,528	132,400	266,315	307,461	7,358,865
1931–32	186,530	2,872,860	8,804,889	152,877	340,337	290,614	8,682,588

CONTROL OF MAMMITIS IN DAIRY COWS.

THE following statements appear in an article by Dr. Minett, of the Research Institute of Animal Pathology, London, in the *Bulletin de l'Office International des Epizooties* for May–June, 1932 :—

"According to certain observers, good results have been obtained in the prevention and treatment of mastitis with vaccines and some success has been recorded also after local or general treatment with chemical substances, especially in cases just commencing. It is doubtful whether these conclusions are justified, the symptoms disappearing frequently during the course of the natural evolution of the disease without other treatment than frequent stripping. It is certain that we do not possess up to now experimental demonstration that sound animals can be immunized or that a complete cure, in the bacteriological sense, can be obtained by an efficacious method. It is as well to have this present knowledge in mind when one examines means of prevention.

"Mastitis in the cow, and in particular the chronic streptococcic form, is so distributed and of such considerable importance that the problem of prophylaxis has become urgent. Up to now any treatment, chemio-therapeutical or immunological, has given no truly satisfactory results, but it is already sufficiently shown that the loss caused by chronic streptococcic mastitis can be considerably reduced by sanitary measures, which implies only the separation of infected milking-cows. For success, the first essential is that all cases of latent infection of the mammary gland should be discovered. It necessitates the utilization, for diagnosis, of laboratory methods; but if, as it is desirable, the examinations are to be conducted on a large scale, conveniently equipped laboratories would be necessary, and without these organization would necessarily be expensive."

Powdered Bluestone for Drenching Sheep.—Mr. L. C. Tonkin, Ettrick, Otago, writes as follows: "From time to time bluestone solution is recommended for drenching sheep and lambs, but perhaps farmers are not generally aware that bluestone can be purchased in powdered form. As we are orchardists as well as farmers we find use of the powdered form very handy. In drenching 600 hoggets three times we merely dissolve 1½ oz. of powdered bluestone in a cooking-bowl holding a gallon of water (it dissolves in cold water immediately). We dip out with a small medicine glass graduated in tablespoonfuls, and giving two tablespoonfuls we find it very easy to dip up the exact amount practically every time. The medicine glass is quite handy enough for pouring the solution down the sheep's throat. The powdered form of bluestone would seem handy also for foot-rot purposes, and a small quantity could be powdered on to any affected foot."